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ABSTRACT

This curriculum guide, developed and used in Wheelersburg (Ohio) with visually talented students, shows how such students can be taught to utilize computers as an art medium and tool. An initial section covers program implementation including setup, class structure and scheduling, teaching strategies, and housecleaning and maintenance. Seventeen specific activities and projects are then described. Given for each are: program objective, subject objective, area of concentration, teacher preparation and orientation, student exploration and activities, materials and supplies, evaluation, and extensions. Illustrations are included. Following the project descriptions additional information is presented including guidelines for evaluation, a computer art evaluation form, a student evaluation form, a student performance checklist, a student project evaluation form, the standard guideline implementation checklist for art specialists in Ohio schools, a discussion of art criticism, and recommended resources on technical hardware and software used in Wheelersburg as well as lists of suggested magazines and organizations and 18 books. Also included are an extensive glossary, explanations of computer art terminology, a discussion of the principles and elements of visual organization, a brief history of computer art, and a bibliography of 41 references. (DB)

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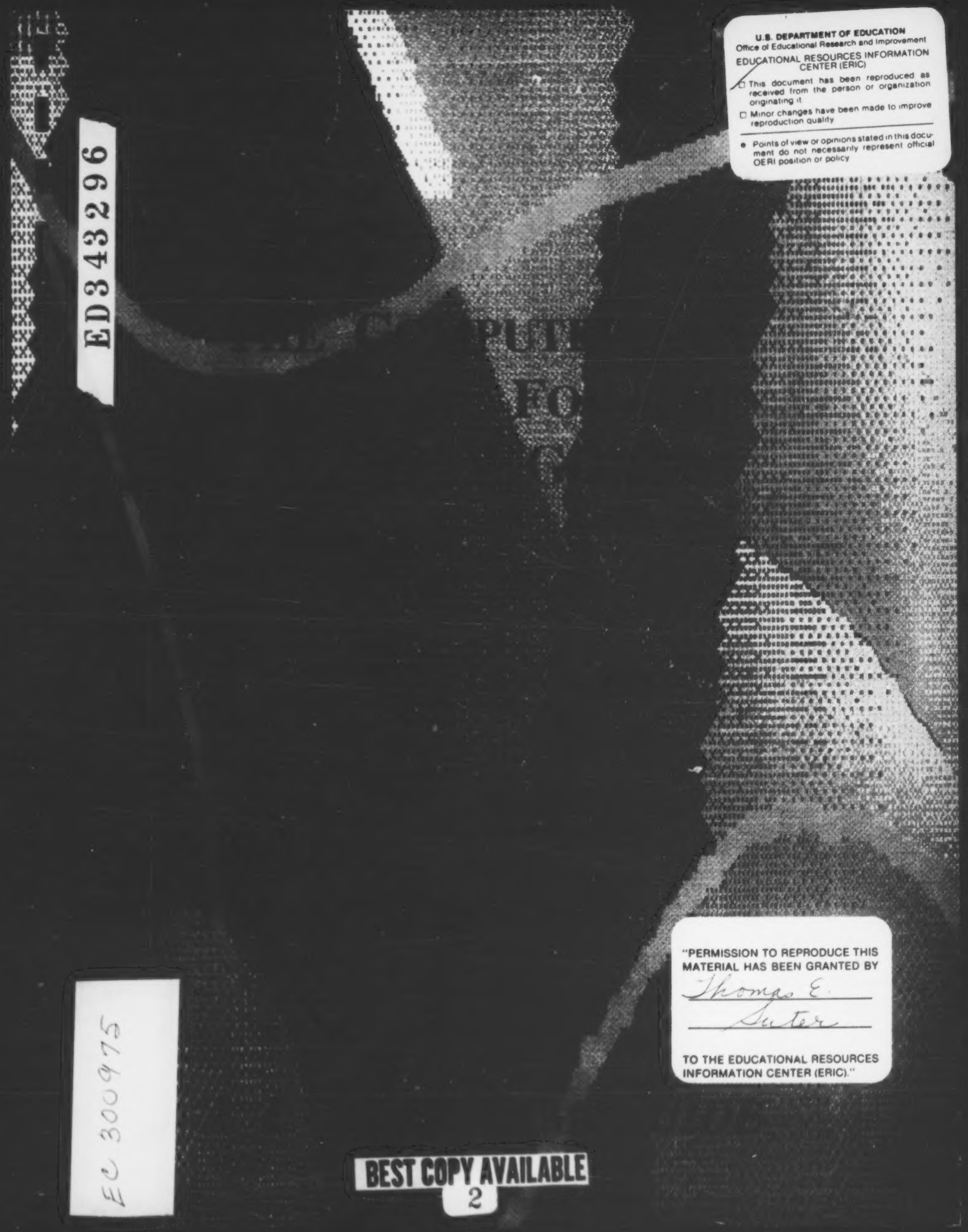

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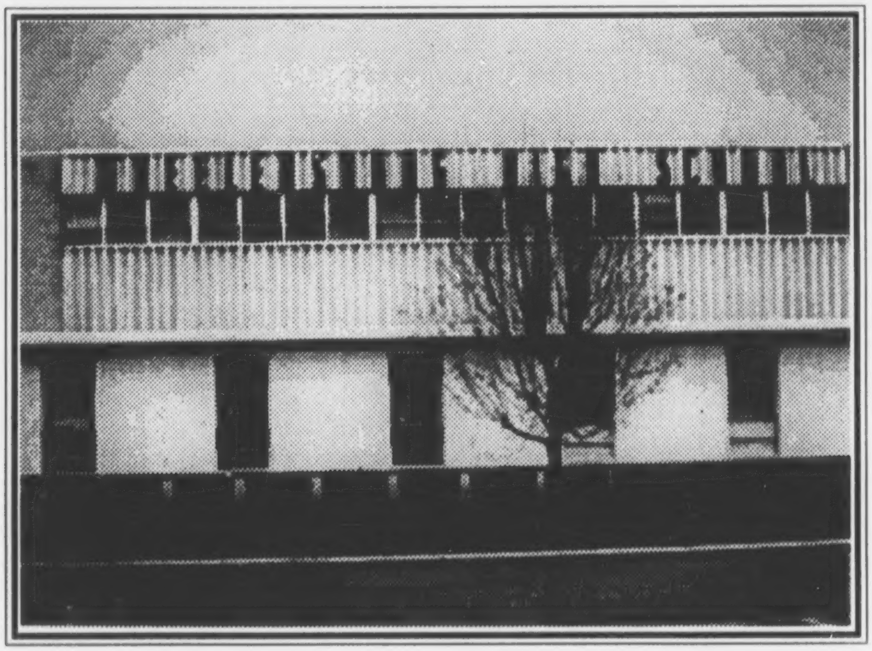
THE COMPUTER: AN ART TOOL FOR THE VISUALLY GIFTED

A Curriculum Guide

Thomas E. Suter

Melissa R. Bibbey



Wheelersburg Local Schools

TABLE OF CONTENTS

INTRODUCTION v

IMPLEMENTATION OF A COMPUTER ART PROGRAM 1
- *The Set-up*
- *Class Structure & Scheduling*
- *Teaching Strategies*
- *Housecleaning & Maintenance*

PROJECT AND ACTIVITIES 5
- *BCAC Format*

EVALUATION 42
- *Teacher, Student, & Program Evaluation Forms*
- *Art Criticism Model*

REFERENCES 59
- *Hardware*
- *Software*
- *Other Resources*

SUMMARY 68

BIBLIOGRAPHY 73

GLOSSARY 77
- *Computer Art Terminology*
- *Elements & Principles of Visual Organization*
- *History of Computer Art*

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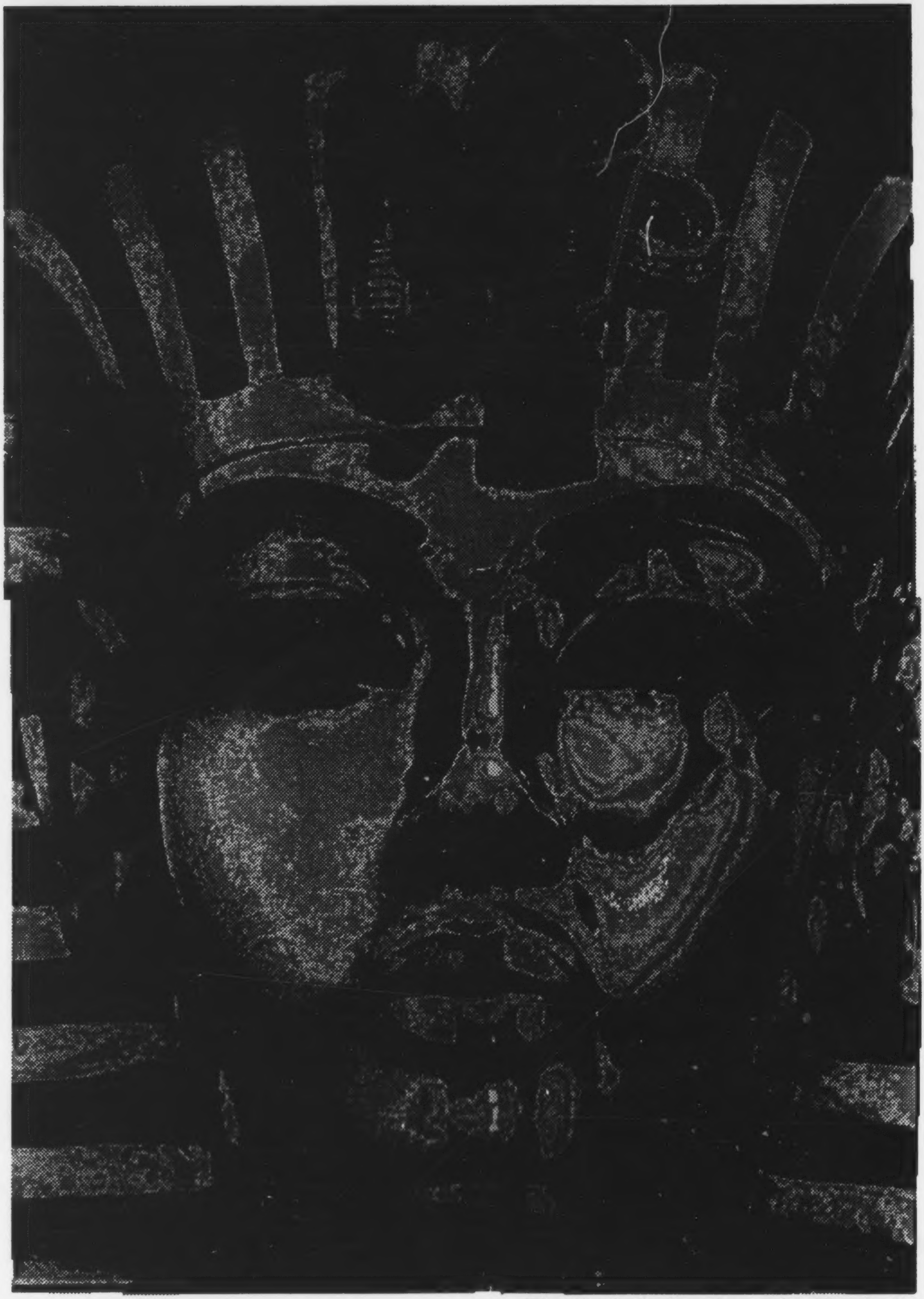

King Tut by junior, *Kassandra Chamberlin*

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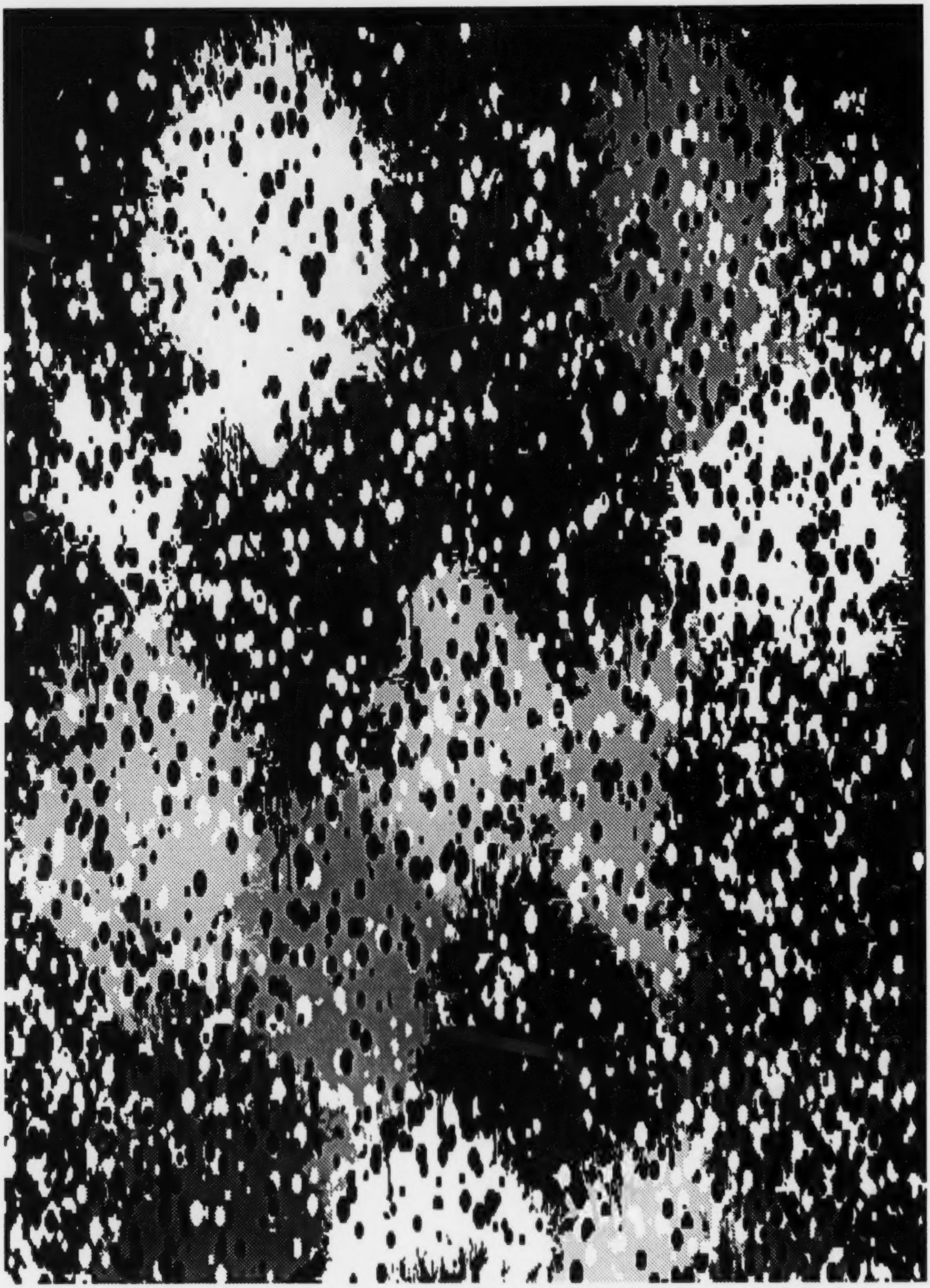
INTRODUCTION

Computer technology and electronic images impact all facets of our lives. This is evident in commercial art, television, video, and filmmaking. In this ever-changing art world we, as educators, face new media challenges. With computers being used in art, the decision to teach and learn or be left behind confronts us. We decided to teach this new media. We constantly learn on our own and with the students. The computer is an exciting media and artistic tool that has been integrated into the art room.

The main purpose of this program is the integration of computers as an art medium and tool into the art curriculum. The use of the computer will take the visually gifted student one step further than the traditional art classroom can. A Computer Art Program will allow visually gifted students to create works of art in much the same way as practicing professionals, using the computer and its peripherals as an art medium and tool. Moreover, this program will allow visually gifted students to compete on a post-secondary level because of the exposure to electronic art and the advancements in technology. This experience will provide a foundation for their future endeavors.

We hope this curriculum guide will provide information and ideas that will help start a Computer Art Program.



Black & White Trees by senior *Trish Holbrook*

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IMPLEMENTATION OF A COMPUTER ART PROGRAM

New changes in the art room can cause excitement, enthusiasm, and problems all at the same time. With a new computer art program being situated in the existing art room , one will soon find out through experimentation that some ideas work and others do not. For convenience, we have included some of our ideas that were successful as well as some things to avoid. We realize that every educational system is unique and different, so we thought we would share the issues of our program, curriculum structure, and some suggestions on phasing in strategies.

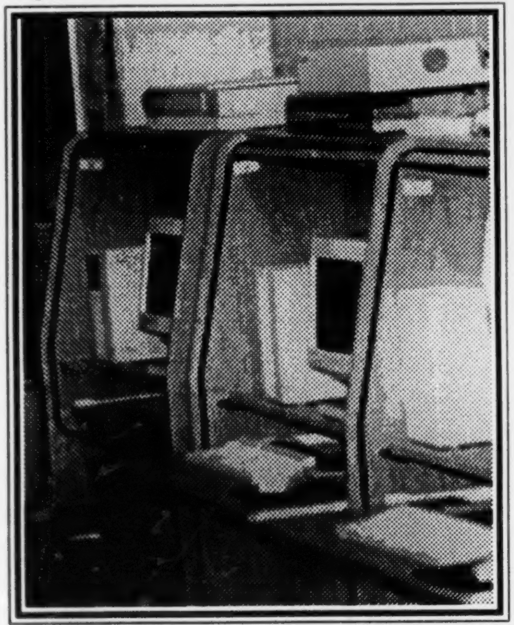
The following points will make the job a little less hectic and more pleasurable.

THE SET-UP

We were able to accommodate a four station set-up in the front of the art room. By shifting around lab tables and deleting one blackboard space, our set-up has worked out. At each station we have a different piece of hardware. For instance, the first station has the Apple scanner, the second the HP PaintJet printer, the third the Apple LaserWriter II NT and the last station encompasses the video equipment for digitizing and animation.

Other things to consider are as follows : proper electrical outlets, cabinets for storage of equipment, air -conditioning, humidity and dust. Our dust problem has been partially solved by purchasing rolltop lockable cabinets with casters. These cabinets not only lock and eliminate the dust, but can be moved.

Trish Holbrook, a senior art student ,working on her computer image.



A partial view of our set-up with the Apple Scanner and HP PaintJet Printer.

CLASS STRUCTURE AND SCHEDULING

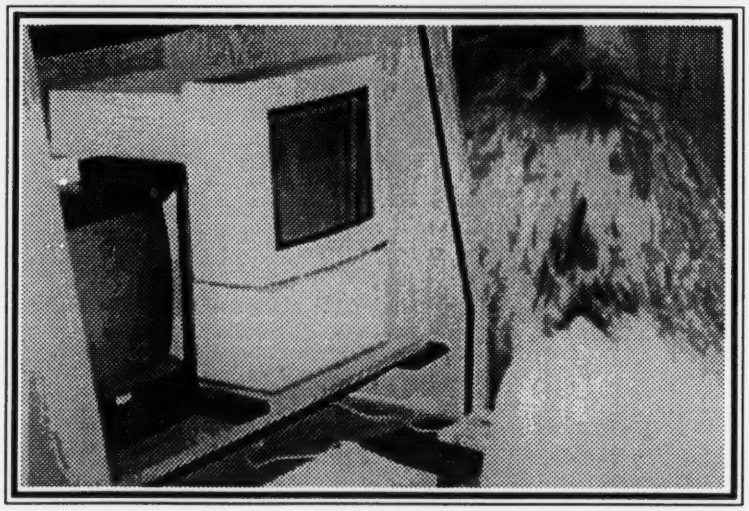
Throughout this guide we have emphasized the importance of the integration of computers with traditional media, we believe that this is an important feature of our program. Others may disagree with our approach and want to just set up a computer art lab, but we believe the computer is a tool and media that should be added to the entire art program. Another reason for this parallel learning environment was the problem of scheduling separate computer art classes due to the art teacher's working day. It would have been virtually impossible to arrange classes just for this program.

Karla Tolbert and Trish Holbrook, senior computer art students are working on their traditional art projects while other art students are at the computer stations.

TEACHING STRATEGIES

The element of time is a key factor in setting up a computer art program. Phasing in time should be accounted for with all participants including the teacher. Assign students a particular station from which they must work on their projects. Create a system for rotating the students on the computers daily, so the amount of time for which each student has worked is balanced. Design a weekly sign-in sheet as a way to monitor the time in which each student has worked. Allow for experimentation and exploration that has some direction and validity. Give ample time for learning the basics and acquiring navigational skills. Do not expect to be an expert, teaching computer art is a most humbling experience. And, finally be prepared for a collaborative learning environment with divergent thinking.

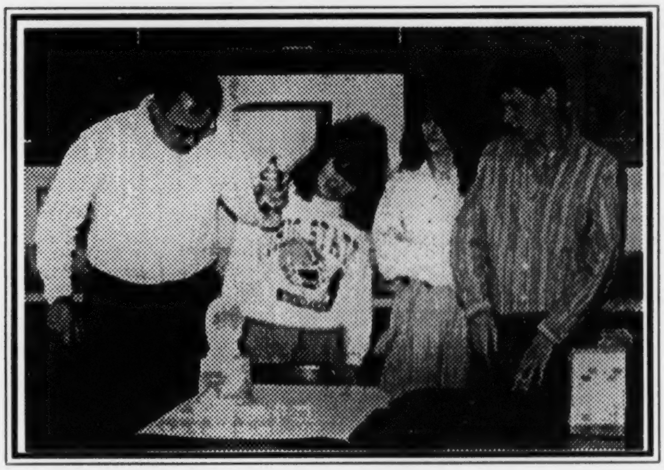
Jeni Millhuff, a junior computer art student working on her projects using Pixel Paint 2.0.



With addtional responsibilities, give yourself some time to be acclimated to this environment, and do not expect results right away. Remember, this is new to all of us. We are constantly learning new things every day.

One added feature with the Macintosh computer is its ability to be used as a teaching assistant, by utilizing the hypermedia capabilities and a videodisc player.

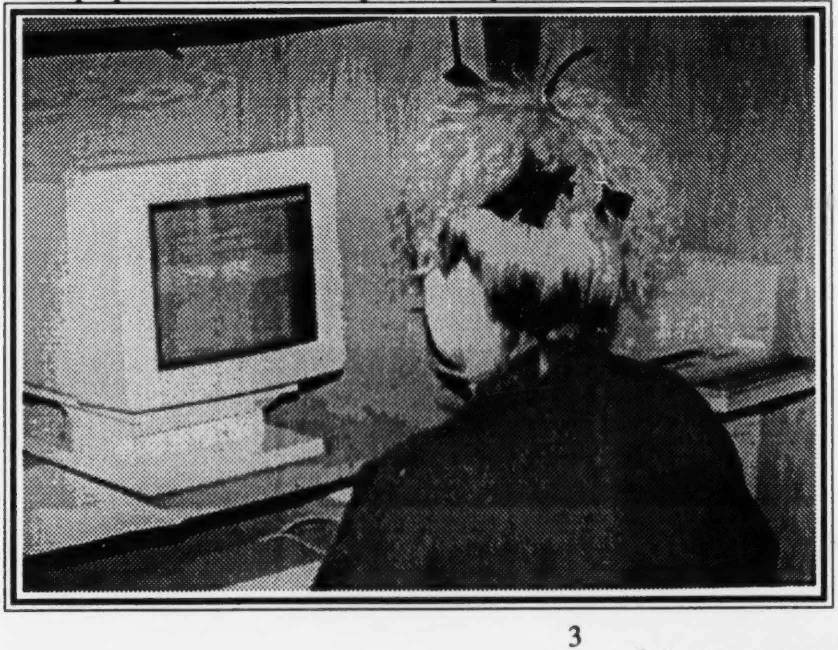
As with traditional media , do demonstrations with the hardware and software in groups and allow students the same experience.



Art Instructor, Tom Suter demonstrating a particular application of a spray finish to Kassandra Chamberlin, Debbie Gyke, and Brian Hutchinson, who were part of his visually gifted program.

HOUSECLEANING AND MAINTENANCE

The care and cleaning responsibilities are crucial to the performance of computers. Read manuals about proper maintenance and precationary measures to avoid future problems.



Nikki Cook, a senior art student, working on her computer projects.

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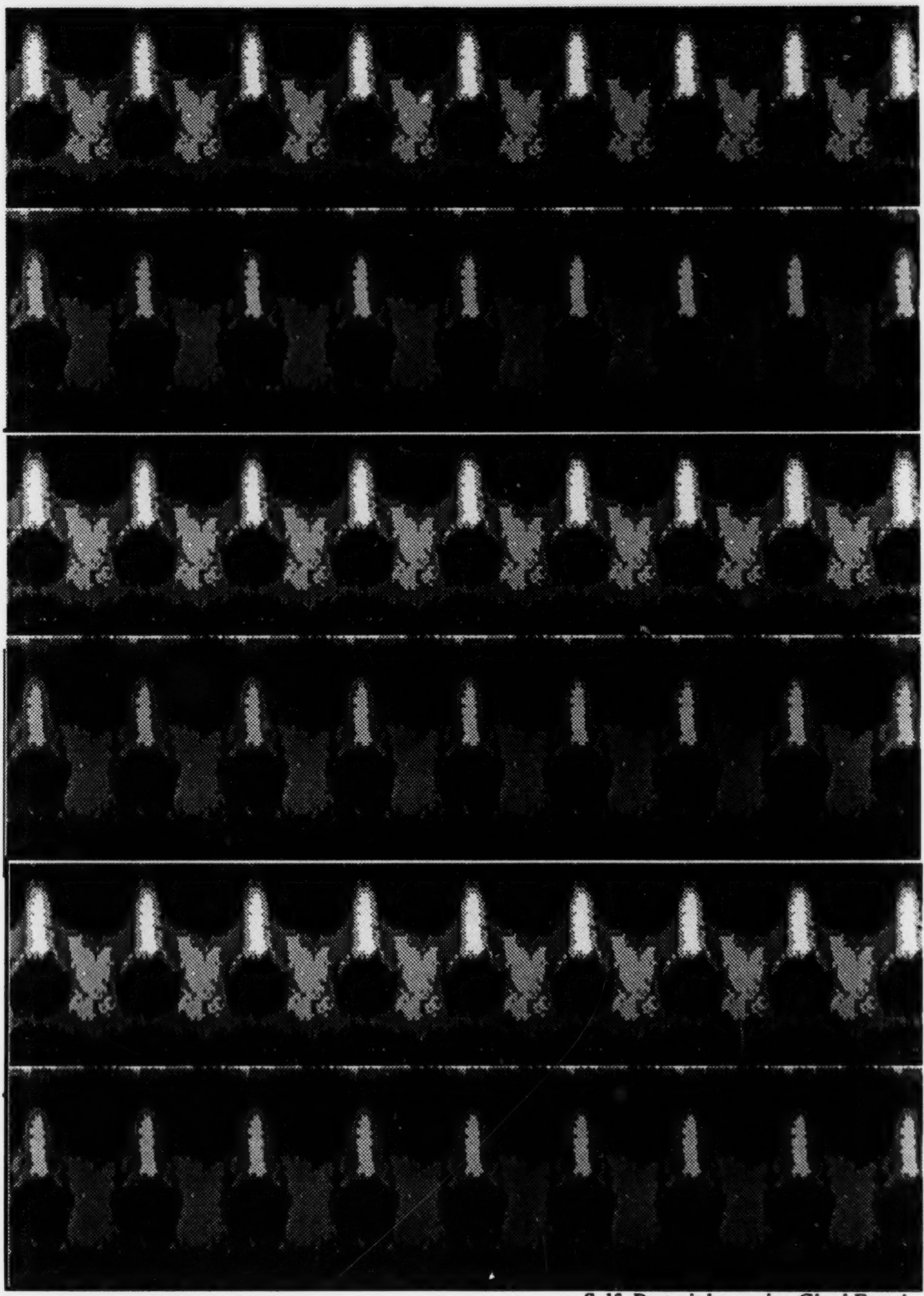

Self- Portrait by senior *Chad Fannin*

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PROJECTS & ACTIVITIES

The following projects and activities are a direct result of the grant for visually gifted students. The lesson plans are designed for an art room where both traditional and non-traditional media are found. The seventeen activities are set-up in three tiers of difficulty for the regular art curriculum in the BCAC (Balanced Comprehensive Art Curriculum) state of Ohio format. A parallel traditional project will complement the computer art project. The significant reason for this is the limited number of computers in the art room. With a class size of seventeen and only four computers, we had to design other activities for the visually gifted students to work on when they were not working at a computer. We are sure that other possibilities will come to mind when you start reading these specific activities , but this is one of the greatest things about teaching with a computer in your art room. The creative possibilities become endless; only imagination is limited.

In addition to individual projects, a group project has been suggested for encouraging collaborative learning. This project will help those who have some difficulty getting started and spur confidence. At the end of each project you will find extensions for further experimentation. We hope these projects will help in developing a program.

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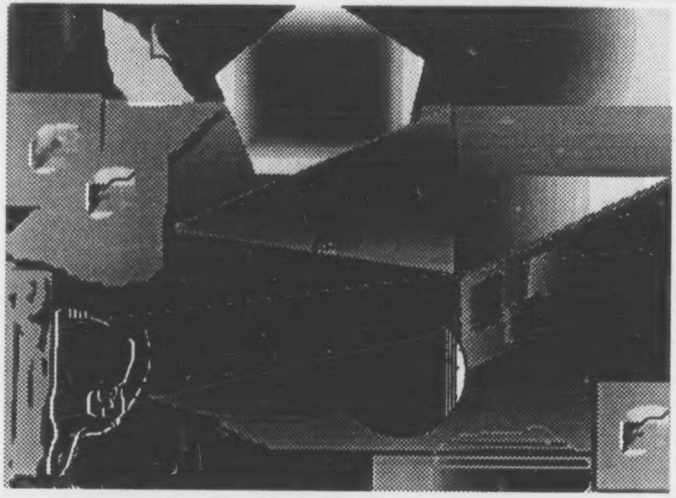
1 *DRAWING* BLACK & WHITE



TIER I
ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to discover ideas for art in personal development.

SUBJECT OBJECTIVE

1. Students will use the principles and elements of visual organization.
2. Students will explore the possibilities of the computer to create an abstract black and white design.
3. Students will use pastels and charcoal to create an abstract drawing.

AREA OF CONCENTRATION

1. Drawing
2. Composition

TEACHER PREPARATION & ORIENTATION

1. Review the Principles and Elements of Visual Organization.
2. Give a demonstration of Pixel Paint.
3. Show visuals of other students' works and artists' works in black and white.

STUDENT EXPLORATION & ACTIVITIES

1. Students will create an abstract design using only a grayscale palette in Pixel Paint.
2. Students design will emphasize some of the Principles and Elements of Visual Organization.
3. Students will save their designs on 800K floppy disks.
4. Students will print out designs using LaserWriter and mat on white posterboard.
5. Students will create an abstract design using:
   (1) charcoal on white 9" x 12"
   (2) white pastel on black 9" x 12"
6. Students will mat the two designs.
7. Students will prepare all three for class critique.

MATERIALS & SUPPLIES

1. Pixel Paint 2.0
2. White paper 9" x 12"
3. Black paper 9" x 12"
4. erasers
5. spray adhesives/fixatives
6. matboards

EVALUATION

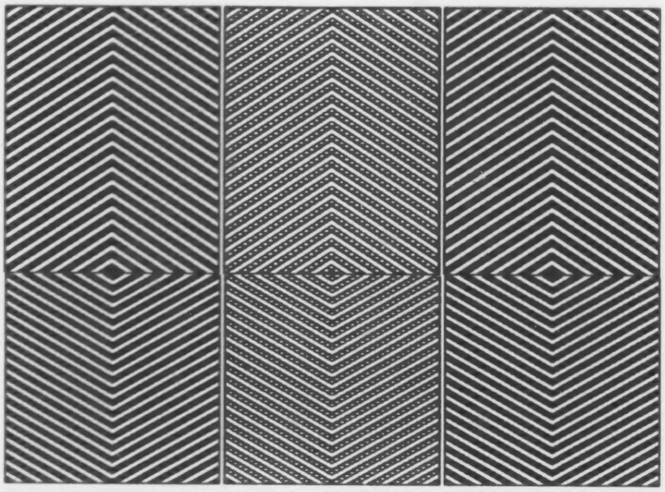
1. Did students learn to use the tools effectively?
2. Did students begin to appreciate the ease and flexibility of the computer?
3. Did students use materials in both projects with knowledge?

EXTENSIONS

1. Translate into monochromatic design.
2. Translate into multi-color pastel: a) warm; b) cool.

2 *DRAWING AND DESIGN*
OP ART

TIER I
ACTIVITY



PROGRAM OBJECTIVE

1. Students will be able to discover ideas for art in personal development.
2. Students will be able to transform ideas to create art.

SUBJECT OBJECTIVE

1. Students will create an op art design using Pixel Paint 2.0.
2. Students will create a black and white drawing that is a figure/ground reversal showing optical effects.

AREA OF CONCENTRATION

1. Design
2. Visual illusionism

TEACHER PREPARATION & ORIENTATION

1. Show students' art work; xerox copies, slides.
2. Show works by Victor Vasarely, Bridget Riley and Larry Poons.
3. Review the Principles and Elements of Visual Organization for Op Art.

STUDENT EXPLORATION & ACTIVITIES

1. Students will use shape and line tools in grayscale Pixel Paint 2.0.
2. Students will create an op art design and save on their disk.
3. Students will explore and experiment with the visual and dynamic effects menu.
4. Print out and mat design.
5. Students will create an outline drawing of an animal and enlarge it to 18" x 24".
6. Students will apply the design or pattern over their drawing.
7. Students are to reverse black to white when they color in their designs. For example: If a horse has vertical stripes, reverse the black for white when you go from background to the figure.
8. Students will mat designs.
9. Students will present for critique.

MATERIALS & SUPPLIES

1. Pixel Paint 2.0
2. Markers, thick and thin
3. Tracing paper
4. Heavy drawing paper 18" x 24"
5. Black India ink, brushes
6. Mat board
7. Tape and spray adhesives

EVALUATION

1. Did students understand how op art works?
2. Did students create a successful design?
3. Did students understand the figure/ground reversal concept?
4. Was the class critique successful?

EXTENSIONS

1. Use complementary colors
2. Do a series of op art designs.

3 *PAINTING* COLOR & EMOTIONS

TIER I
ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to discover ideas for art in personal development.

SUBJECT OBJECTIVE

1. Students will understand how colors can show emotions.
2. Students will select and create a specific color scheme in Pixel Paint.
3. Students will create a design using letters of a word that shows emotion and color in with markers.
4. Students will understand the visual metaphor of color with emotions.

AREA OF CONCENTRATION

1. Painting
2. Drawing
3. Design/Illustration

TEACHER PREPARATION & ORIENTATION

1. Show slides of artists whose work has emotional content.
2. Demonstrate Pixel Paint using color picker/quick edit color.
3. Demonstrate the emotional effects of color.
   i.e. How certain colors have physiological effects on people.
4. Make a list of words which show or could reflect emotions/Have students draw from a hat for their word.

STUDENT EXPLORATION & ACTIVITIES

1. Students will create an abstract design that illustrates the emotional content of your word, (i.e. anger, awesome, powerful, suspicious), that they drew from the hat.
2. Students will use Pixel Paint 2.0 and experiment with:
    a. effects/visual, dynamic
    b. colors
    c. shapetools
    d. brush tools
3. Students will save design as their word.
4. Students will print out and mat their design on posterboard.
5. Students will create another design using the letters of their word/trace/repeat/overlap/ combine letters.
6. Students will use specific colors for emotional effect.
7. Students will mat and present both for class critique.

MATERIALS & SUPPLIES

1. Software - Pixel Paint 2.0
2. 12" x 18" white drawing paper
3. 12" x 18" tracing paper
4. markers/color pencils/oil pastels
5. matboard
6. spray adhesives
7. tape

EVALUATION

1. Did students create and understand how colors express emotion?
2. Did students explore and experiment with the effects of colors?
3. Did students discuss how certain colors express emotion?

EXTENSIONS

1. Color field painting
2. Expressionism painting.
3. Illustrations on color designs for commercial markets.

4 *PAINTING* EXPLORING THE MASTERS

TIER I ACTIVITY

PROGRAM OBJECTIVE

1. Students will understand how artists, past and present, express themselves through creating works of art.
2. Students will know how artists discover ideas for art in personal experience.
3. Students will know how artists transform ideas to create art.
4. Students will know how artists work with media to create art.

SUBJECT OBJECTIVE

1. Students will compare great artists and their works through art prints, postcards, books, slides, and art publications.
2. Student will scan in black and white, a masterpiece, create their own palette and paint on the computer and canvas board.

AREA OF CONCENTRATION

1. Painting
2. Media
3. Tools

TEACHER PREPARATION & ORIENTATION

1. Show specific artists and periods of art.
2. Demonstrate color palettes/and quick edit color.
3. Demonstrate using the Apple scanner.
4. Show painting techniques: color mixing, applications of paint, impasto, blending, and stippling.

STUDENT EXPLORATION & ACTIVITIES

1. Students will select one masterwork and scan it in black and white using line art, halftone, or graymap.
2. Students will set DPI at 150, scan, save, and convert to a Pixel Paint document.
3. Students will paint in own palette, print and mat.
4. Students will select a masterwork and paint on canvas board.
5. Students will use acrylics and create their own palette.
6. Students will finish work, apply varnish, and prepare for presentation.

MATERIALS & SUPPLIES

1. Pixel Paint
2. Apple scanner
3. Scannable masterworks copies.
4. Acrylic paints, brushes, canvas board
5. spray fixatives and adhesives
6. matboard
7. tape, plastic knives, cups & plates
8. aluminum

EVALUATION

1. Did students recognize and appreciate specific style and palettes of particular artists works?
2. Could students create their own work?
3. Did students understand composition and structure in a work by a master?
4. Did class critique involve students' own work and not the masterwork?

EXTENSIONS

1. Abstract painting into section/create a series of works.
2. Change and alter compositions

5 *PAINTING* SELF - PORTRAITS

TIER I
ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to express themselves through art.
2. Students will be able to discover ideas in art in personal development.

SUBJECT OBJECTIVE

1. Students will experiment and explore the video camera and Computer Eyes as a digitizer.
2. Students will create a self-portrait, expressing an emotion.

AREA OF CONCENTRATION

1. Painting
2. Media

TEACHER PREPARATION & ORIENTATION

1. Demonstrate Computer Eyes/tools/preview.
2. Show angle of light/camera position.
3. Show the video camera and tools.
4. Show examples of famous self-portraits, i.e. Rembrandt, Cezanne, Picasso, Chuck Close.
5. Discuss video drawing (Myron Krueger).

STUDENT EXPLORATION & ACTIVITIES

1. Students will familiarize themselves with the video camera and Computer Eyes software.
2. Students will select preview/camera/background/direct light expression.
3. Students will capture in black and white, save and convert picture into Pixel Paint 2.0
4. Students will paint picture in Pixel Paint 2.0, print out and mat.
5. Students will create a high contrast self-portrait from print out or from mirror with light source (spotlight).
6. Draw onto 18" x 24" white paper and use black contact paper to cut out shapes to create self-portrait.
7. Drawing is to be matted.
8. Students will present for class critique.

MATERIALS & SUPPLIES

1. Computer Eyes, video camera, spotlight, tripod, cables
2. Pixel Paint 2.0
3. contact paper (black on white)
4. 18" x 24" drawing paper (white or black)
5. X-acto knives and blades
6. scissors
7. mat board
8. spray adhesives

EVALUATION

1. Did students learn how to digitize?
2. Did students learn how to make a high contrast on black and white self-portrait?
3. Did students create their design using black and white only?

EXTENSIONS

1. Printmaking project
2. Use color

6 *PAINTING* SELF- PORTRAIT WITH OBJECTS

TIER II
ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to express themselves through art.
2. Students will be able to discover art in personal development.

SUBJECT OBJECTIVE

1. Students will experiment and explore the video camera and Computer Eyes as a digitizer.
2. Students will create a self-portrait with inanimate objects of personal choice using a digitizer.
3. Students will create a sculpture using found objects.

AREA OF CONCENTRATION

1. Painting, video
2. Sculpture

TEACHER PREPARATION & ORIENTATION

1. Show slides of artists' self-portraits.
2. Show slides of students' sculptures.
3. Demonstrate cut and paste in Pixel Paint.
4. Demonstrate using the scrapbook.

STUDENT EXPLORATION & ACTIVITIES

1. Students will digitize themselves and objects of personal interest.
2. Students will capture, save and paint in Pixel Paint 2.0.
3. Students will use the paste, cut, and scrapbook commands.
4. Students will paint, print out and mat their designs.
5. Students will collect thirty (30) objects and create a sculpture that resembles human form.
6. Sculpture must not exceed 36" in any dimension.
7. Sculpture must include one (1) moving part.
8. Students will present both pieces for class critique.

MATERIALS & SUPPLIES

1. Video camera, Computer Eyes, Pixel Paint.
2. mat board
3. found objects
4. wire, rubber bands, coat hangers,
5. tools, glue, tape

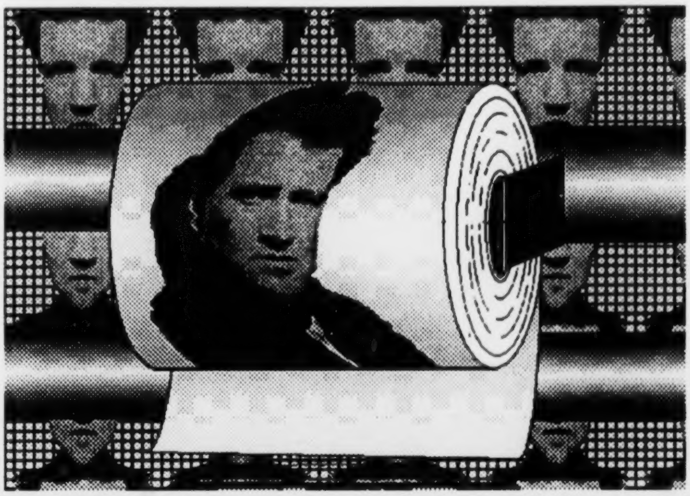
EVALUATION

1. Did students integrate objects into their art?
2. Did students understand that their own aesthetic choices reveal their personalities?
3. Did students learn new things about themselves and friends and family?

EXTENSIONS

1. Have students do a self-portrait with words only.
2. Have students place their images and faces on objects.

7 *PAINTING* HUMANSCAPE



TIER II
ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to discover ideas for art in personal experiences.
2. Students will know how artists work with media to create art.

SUBJECT OBJECTIVE

1. Students will create a design/collage using scanned or digitized images.
2. Students will view ways artists experiment with materials to discover new possibilities and limitations.

AREA OF CONCENTRATION

1. Mixed media/collage
2. Painting

TEACHER PREPARATION & ORIENTATION

1. Show slides of PIcasso, Braque with cubism and collages.
2. Show slides of students' works.
3. Review David Hockney in *Art and Man*, April/May 1990.
4. Discuss collage and mixed media.
5. Discuss humanscape.

STUDENT EXPLORATION & ACTIVITIES

1. Students will scan different textures, images, and faces to create a landscape or cityscape using their scanned images.
2. Students will scan and paint in Pixel Paint.
3. Students will print out using tiles to make a four tile print, mount, and mat.
4. Students will use magazines, newspapers, computer printouts, etc. to make a collage using glue and scissors . (i.e. pictures and images of face into landscape)
5. Students will mount collage on posterboard.
6. Students will present both for class critique.

MATERIALS & SUPPLIES

1. Pixel Paint
2. Apple scanner
3. magazines, newspapers and pictures
4. glue, scissors
5. spray adhesive
6. posterboard, mat board

EVALUATION

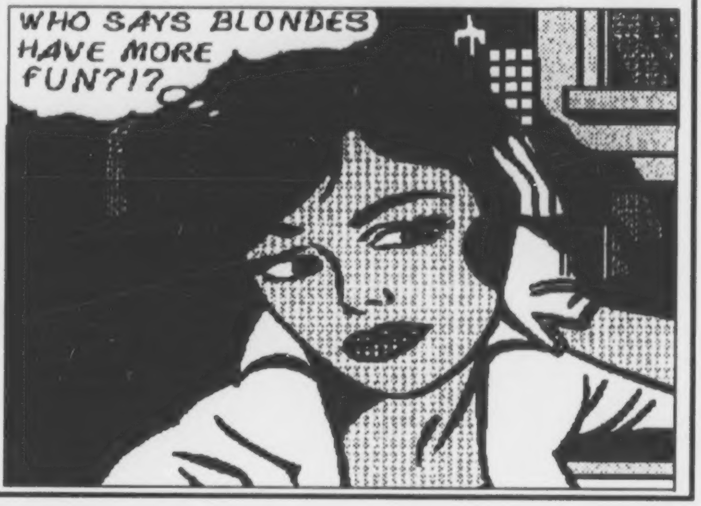
1. Did students understand collage as an art form?
2. Could students manipulate images into a different composition?
3. Did class critique reveal the way artists experiment with media?

EXTENSIONS

1. Incorporate words or textures into design.
2. Use video camera for extra images.

8

PAINTING
MASTERWORK 2


WHO SAYS BLONDES HAVE MORE FUN?!?

TIER II
ACTIVITY

PROGRAM OBJECTIVE

1. Students will know how artists transform ideas to create art.
2. Students will know how artists work with media to create art.

SUBJECT OBJECTIVE

1. Student will scan, in black and white, a masterwork and create a new composition and paint it in his or her own palette choices.

AREA OF CONCENTRATION

1. Painting
2. Composition

TEACHER PREPARATION & ORIENTATION

1. Show slides of artists where other artists have done their own interpretations of masterworks from the past.

STUDENT EXPLORATION & ACTIVITIES

1. Students will select one masterwork. Scan in black & white.
2. Students will develop their own palette change composition,and create a painting using PixelPaint 2.0.
3. Students will print a copy and mat.
4. Students will select one masterwork and transfer to stretched canvas and paint.
5. Students will finish and varnish.
6. Students will prepare for class critique.

MATERIALS & SUPPLIES

1. Pixel Paint software.
2. Apple scan.
3. Copies of masterworks to scan.
4. Mat board.
5. Acrylics.
6. Spray adhesives and fixatives.
7. Tape and tracing paper.

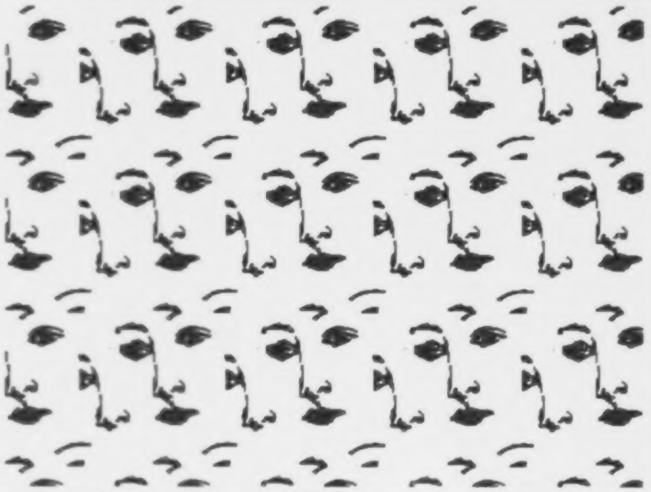
EVALUATION

1. Did students create their own work?
2. Did students gain appreciation for other artists?
3. Were the paintings altered and fresh images created?

EXTENSIONS

1. Students create their own painting using a specific artist's palette of colors.

9 *SURFACE DESIGN* WRAPPING PAPER



TIER II
ACTIVITY

PROGRAM OBJECTIVE

1. Students will become aware of how society works with its technologists to make visual forms.

SUBJECT OBJECTIVE

1. Student will understand how computers are impacting and changing the profession of surface design by creating a wrapping paper design using the Macintosh computer.
2. Student will understand changes in art objects resulting from the introduction of new media, tools and materials.

AREA OF CONCENTRATION

1. Graphic design/Commercial art

TEACHER PREPARATION & ORIENTATION

1. Demonstrate tiles and brush design.
2. Show examples of wrapping paper.
3. Discuss repeat pattern and texture.
4. Show quilt designs from local Ohio artists.

STUDENT EXPLORATION & ACTIVITIES

1. Students will select a popular image that they think would sell in the commercial market for wrapping paper.
2. Students will draw, scan or digitize that image and reduce to a 1" square.
3. Students will use capture tools; marquee and lasso to manipulate the image.
4. Students will create their own design.
5. Students will use the scrapbook using cut, copy and paste.
6. Students will use the tile command and then fill with the bucket function. (Consult user's manual.)
7. Students will bring in a small box and wrap it with the paper for the critique.
8. Students will make a design on a 1" art gum eraser.
9. Students will make a stamp print.
10. Students will mat print for class critique.

MATERIALS & SUPPLIES

1. Pixel Paint
2. Art gum erasers
3. Lino zip knives/X-Acto knives.
4. Stamp pads and prints
5. Mat board/Posterboard
6. Small jewelry boxes
7. Tape

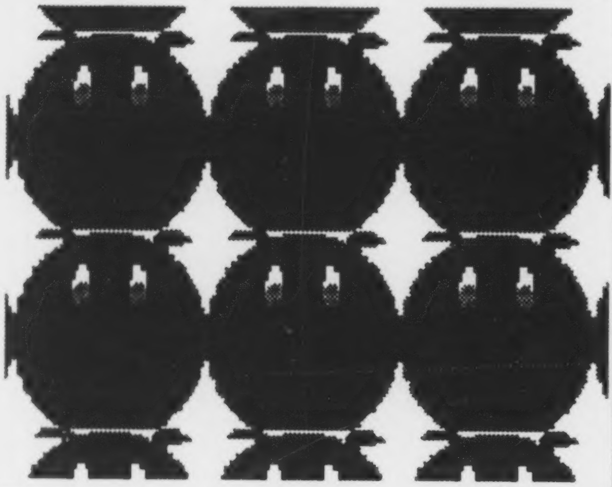
EVALUATION

1. Did students learn to appreciate the commercial design field?
2. Did students use the tile command?
3. Did students comprehend repeat pattern in design?

EXTENSIONS

1. Group quilt design pattern.
2. Paper design packages on a particular theme.

10 *3-D DESIGN* ORIGAMI PAPER



TIER II
ACTIVITY

PROGRAM OBJECTIVE

1. Students will know how artists work with media to create art.

SUBJECT OBJECTIVE

1. Students will know how artists and craftsmen experiment with media.
2. Students will experiment and create an origami sculpture.

AREA OF CONCENTRATION

1. Surface design.
2. Sculpture.
3. Paper.

TEACHER PREPARATION & ORIENTATION

1. Demonstrate paper folding.
2. Explain Eastern and Oriental philosophy.
3. Show photocopy examples of works from books.
4. Emphasize the importance of technique.

STUDENT EXPLORATION & ACTIVITIES

1. Students will select a specific object to create an origami sculpture.
2. Students will practice paper folding and going over folding lines.
3. Students will create a design in Pixel Paint that is indicative of your sculpture.
4. Students will print out paper and apply correct folds to create their sculpture.
5. Students will display for class critique.

MATERIALS & SUPPLIES

1. Pixel Paint
2. Origami paper
3. Book and copies of instructions for folding procedures

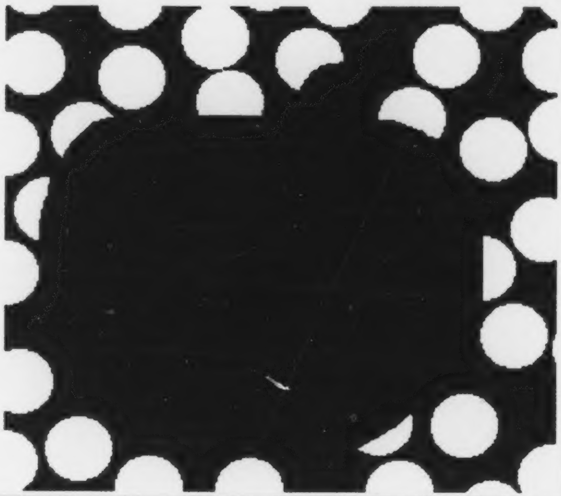
EVALUATION

1. Did students understand and appreciate other cultural art experiences?
2. Could they fold paper into sculpture?
3. Could they apply texture and pattern to their paper for their sculpture?

EXTENSIONS

1. Digitize an origami sculpture and place in an environment.

11 *DESIGN APPLES*



TIER III
ACTIVITY

PROGRAM OBJECTIVE

1. Students will become aware of career opportunities in art.
2. Students will become aware of how society works with its technologists to make visual forms.

SUBJECT OBJECTIVE

1. Professional graphic designer will speak to class on her profession, career opportunities and her utilization of the Macintosh computer.
2. Students will create an illustration of Apples for a group critique with the professional designer.

AREA OF CONCENTRATION

1. Graphic design
2. Careers in art

TEACHER PREPARATION & ORIENTATION

1. Contact graphic designer about class presentation.
2. Introduce graphic design as a career possibility.
3. Prepare examples of illustrations on a particular theme.

STUDENT EXPLORATION & ACTIVITIES

1. Students will create 35 apples from different media. The size of each apple should not exceed a 4" x 4" square.
2. Students will choose twenty of their best illustrations.
3. These will be mounted on illustration board for group critique with the graphic designer.

MATERIALS & SUPPLIES

1. Mixed media must be available
2. Computer
3. Software
4. Glue paper
5. Spray adhesive
6. 16" x 20" illustration board

EVALUATION

1. Did students complete illustration?
2. Did students understand that a simple theme may have countless possibilities?
3. Did students become aware of careers in the art field?

EXTENSIONS

1. Visit a graphic designer's studio.
2. Create a group project for presentation.

12 *PAINTING* MASTERWORKS 3

TIER III
ACTIVITY

PROGRAM OBJECTIVE

1. Students will work with media to create art.
2. Students will be able to transform ideas to create art.

SUBJECT OBJECTIVE

1. Students will select a masterwork and make six progressional changes using the computer.
2. Students will create a flipbook using a real Macintosh apple and post-it note books.

AREA OF CONCENTRATION

1. Concept of change and time.
2. Animation
3. Movement

TEACHER PREPARATION & ORIENTATION

1. Show examples of short animation sequences.
2. Show flipbooks made by past students.
3. Bring Macintosh apples to class.

STUDENT EXPLORATION & ACTIVITIES

1. Students will pick out an apple and draw the apple on post-it note book. (Start in back)
2. Students will take a bite of the apple and then draw it on the next preceding page in post-it notebook.
3. Repeat Step 2 until apple is gone, except the core.
4. Students will select a masterwork, scan and save.
5. Students will then paint the masterwork and do six progressional and sequential changes, to create movement or suggest a change in time.
6. Students will print out and mat each change and present in order for a critique with flipbooks.

MATERIALS & SUPPLIES

1. Pixel Paint
2. Macintosh apples
3. Post-it notebooks
4. Matboard/Posterboard
5. Spray adhesives

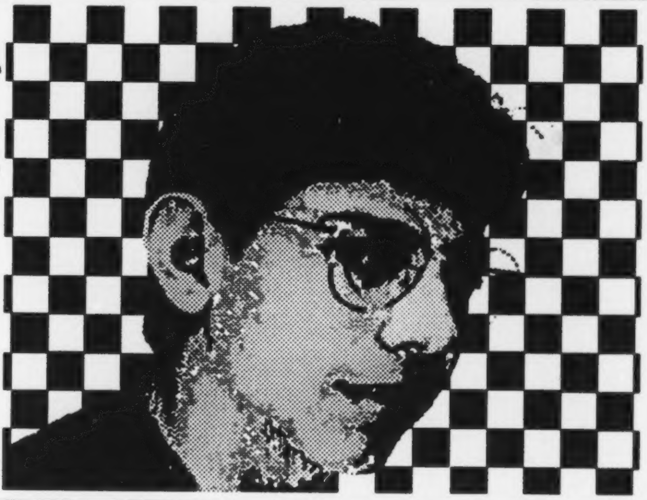
EVALUATION

1. Did students comprehend animation and the concept of time?
2. Did students understand how movement can be created from drawings in sequence?

EXTENSIONS

1. Short animated films with sound.
2. Book illustrated in words and pictures

13 *PAINTING* SELF-PORTRAIT OVERSIZE



TIER III ACTIVITY

PROGRAM OBJECTIVE

1. Students will be able to express themselves through art.
2. Students will be able to discover ideas in art in art in personal development.

SUBJECT OBJECTIVE

1. Students will create an oversize self portrait using the computer and video camera.
2. Students will create a life-size self portrait on large brown kraft paper using charcoal.

AREA OF CONCENTRATION

1. Painting
2. Drawing

TEACHER PREPARATION & ORIENTATION

1. Show examples of artists who work on a large scale. For example, Chuck Close.
2. Talk about and discuss how artists work on a large scale.

STUDENT EXPLORATION & ACTIVITIES

1. Students will digitize themselves using Computer Eyes, save and paint in Pixel Paint 2.0.
2. Students will enlarge this image from 200% to 400% using tiles and print out.
3. Students will mount and mat this on large posterboard.
4. Students will draw a life-size self portrait on brown kraft paper using charcoal.
5. Students will spray with fixative.
6. Students will present both images for class critique.

MATERIALS & SUPPLIES

1. Computer Eyes, video camera and Pixel Paint 2.0
2. Posterboard
3. Spray adhesives and fixative
4. Charcoal sticks
5. Brown kraft paper

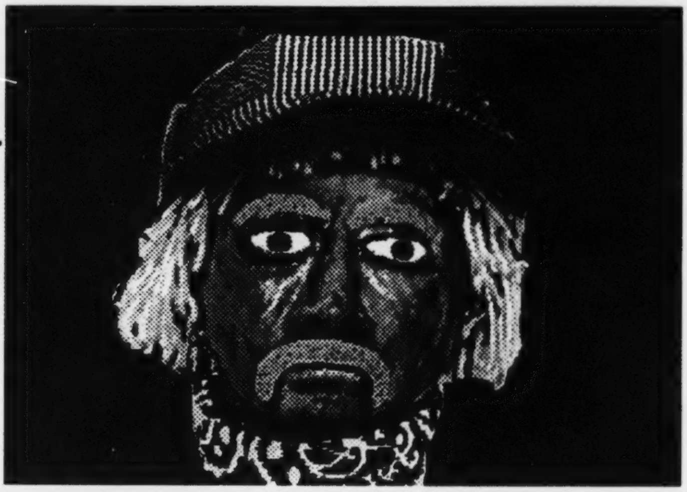
EVALUATION

1. Did students use the enlargement % command?
2. Did students work well on the large scale?
3. Did students present their work adequately?

EXTENSIONS

1. Group oversize gird drawing of famous person on large scale; each student does a portion of the image.

14 *PAINTING* CERAMICS



TIER III
ACTIVITY

PROGRAM OBJECTIVE

1. Students will work with media to create art.
2. Students will be able to discover ideas for art in personal experiences.

SUBJECT OBJECTIVE

1. Students will use clay to create a ceramic bust that shows an emotion.
2. Students will digitize their ceramic bust to create a different image using the Macintosh computer.

AREA OF CONCENTRATION

1. Ceramics/Sculpture
2. 3-D modeling

TEACHER PREPARATION & ORIENTATION

1. Prepare clay.
2. Show demonstration of modeling in clay.
3. Give slide presentation of students' works.

STUDENT EXPLORATION & ACTIVITIES

1. Students will start with a solid clay brick and mold into an oval and a square.
2. Students then place the oval on the square.
3. Students will model the facial features and create emotional expression.
4. Students will then cut the top off the head mark location, scoop out (like a pumpkin)to a wall thickness of 1/2" ; replace top on head, build ears and hair; fire, decorate and paint.
5. Students will digitize this using Computer Eyes, save and paint in Pixel Paint. Image will then be printed out and matted.
6. Students will present both images for class critique.

MATERIALS & SUPPLIES

1. Books, slides, and handouts on clay.
2. Terra-cotta clay.
3. Clay tools, plastic bags
4. Acrylic paints and decorative items.
5. Pixel Paint
6. Spray adhesives
7. Mat board

EVALUATION

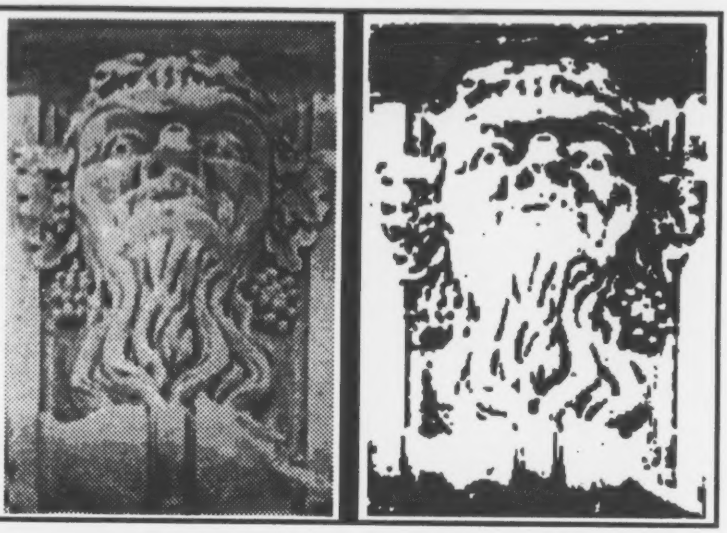
1. Did students work and understand the different views of a three-dimensional artwork?
2. How did students work from 3-D back to 2-D imagery?

EXTENSIONS

1. Digitize themselves, create self-portrait in clay.
2. Animate facial features using the computer.

15 PHOTOGRAPHY *PAINTING*

TIER III
ACTIVITY



PROGRAM OBJECTIVE

1. Students will be able to discover ideas for art in personal experiences.
2. Students will be able to transform ideas to create art.

SUBJECT OBJECTIVE

1. Students will shoot, process and print out a series of six black & white photographs.
2. Students' photographs will be taken from a particular environment.
3. Students will select one photograph, scan and paint it using the computer.

AREA OF CONCENTRATION

1. Photography
2. Painting
3. Composition

TEACHER PREPARATION & ORIENTATION

1. Handouts about photography.
2. Demonstration of camera usage.
3. Demonstration of darkroom techniques.
4. Demonstration of mounting and matting techniques.

STUDENT EXPLORATION & ACTIVITIES

1. Students will select a particular environment and take a series of six photographs to describe space. (Shoot at least two rolls of film.)
2. Students will process their negatives.
3. Students will select a progression or sequence of images from a contact sheet for printing.
4. Students will print and develop images on 8" x 10" polycontrast RC III paper.
5. Students will mount and mat images on white matboard.
6. Students will select one photograph, scan, and paint using Pixel Paint for class critique.
7. Students will print out and mat all works for presentations.

MATERIALS & SUPPLIES

1. Photo supplies for black & white
2. Cameras
3. Paper
4. Matboard, photo mount
5. Software: Apple Scan and Pixel Paint

EVALUATION

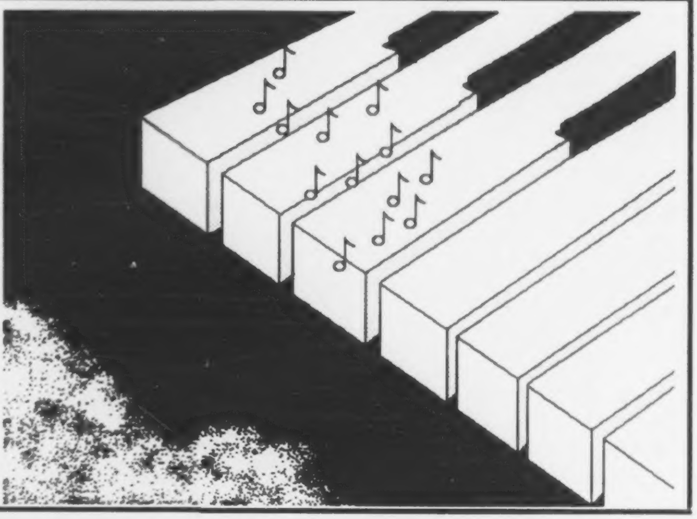
1. Did students convey a message in their space series?
2. How did color images read against black & white images?
3. Was the class presentation adequate?

EXTENSIONS

1. Short animation piece in Macromind Director software.

16 *SOUNDSCAPE* SCULPTURE & DESIGN

TIER III ACTIVITY



PROGRAM OBJECTIVE

1. Students will know how artists transform ideas to create art.
2. Students will know how artists work with media to create art.

SUBJECT OBJECTIVE

1. Students will view ways artists experiment with materials to discover possibilities and limitations.
2. Students will create a sound environment by using a macrecorder and the Macintosh computer.
3. Students will create a cardboard bas-relief of their soundscape in abstract visual form.

AREA OF CONCENTRATION

1. Sound as an art form
2. Multi-media presentation

TEACHER PREPARATION & ORIENTATION

1. Show and record works by John Cage, Laurie Anderson, Brian End and Phillip Glass.
2. Talk about performance art and how sound is an art form.
3. Create a visual abstraction of sound.

STUDENT EXPLORATION & ACTIVITIES

1. Students will record three normal everyday sounds into MacRecorder.
2. Students will then manipulate, change and integrate it into a sound environment.
3. Students should think of how a sound would look; i.e. broken glass.
4. Students will do a visual abstraction of their sound creations using cardboard.
5. Students should make sure their three sounds are represented in visual form.
6. This may be done in color if desired.
7. Students will play and present their visual images in a class critique.

MATERIALS & SUPPLIES

1. MacRecorders/Stereo sound
2. Cardboard
3. Glue, paint, or oil pastels.
4. Tapes

EVALUATION

1. Did students understand how to visually abstract a sound?
2. Did students visual forms reflect or represent their sound environment?

EXTENSIONS

1. Short films
2. Show landscape, seascape, cityscapes and create a soundtrack for the image.

17 *BILLBOARD DESIGN*
GROUP PROJECT

TIER III
ACTIVITY

WHEELERSBURG HIGH SCHOOL

FUNDED BY
THE OHIO DEPT.
OF EDUCATION
DIVISION OF
SPECIAL EDUCATION

SPONSORED
BY
DOW CHEMICAL CO.

COMPUTER ART PROGRAM

PROGRAM OBJECTIVE

1. Students will become aware of how society perceives and recognizes visual images.
2. Students will become aware of how society responds to art and design.

SUBJECT OBJECTIVE

1. Students will work as a group to design a billboard for advertisement to be located on a nearby roadway using the computer for their designs.

AREA OF CONCENTRATION

1. Advertisement
2. Design

TEACHER PREPARATION & ORIENTATION

1. Discuss the field of commercial art.
2. Show examples of other billboards.
3. Discuss budgets, rental space, time, and communication of the design.

STUDENT EXPLORATION & ACTIVITIES

1. Students will make a design for the billboard using the size 9" x 22".
2. Students will bring to class for group discussion.
3. Students will vote on the best design features of each others work.
4. Students will be responsible for a part of the final design.
5. Students will submit their group design to the advertising company for approval.
6. The billboard will then be printed and displayed.

MATERIALS & SUPPLIES

1. Paper
2. Markers
3. Computer ; software for printing

EVALUATION

1. Did students work effectively as a group?
2. Did they realize that most design firms work in the team concept?
3. Did the final design reflect the finished product?

EXTENSIONS

1. T-shirt designs for school art club.
2. Button designs for school art club.

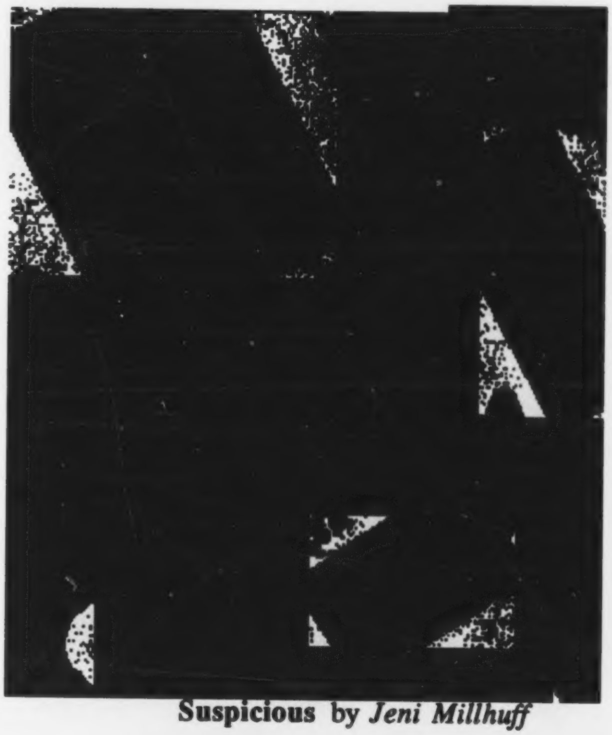
The following Color Plates
were printed on a
NEC Colormate PS-NT3232-115
Color Laser Printer

The Wheelersburg High School
Computer Art Students

Would like to Give

Special Thanks To:
Pat Riggs
Kathy Clay
&
Dow Chemical Co.
(Hanging Rock Plant)
for
Printing Our Color Plates

Experimental Images



Suspicious by *Jeni Millhuff*

1/2 of Flower by *Nikki*

Junk by *Eric Keister*

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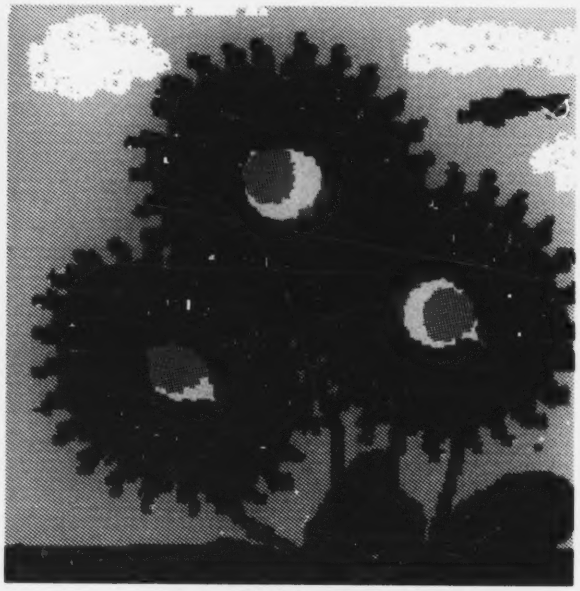
Experimental Images

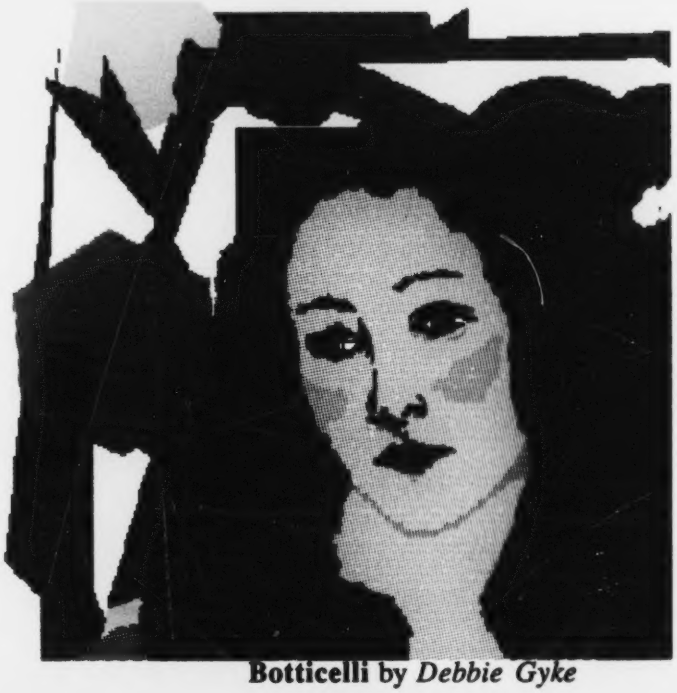
Ultra Ball by *Ryan Bussey*

Art Forum Toys by *Tricia Holbrook*



Remedial by *Debbie Gyke*

Masterworks



Botticelli by *Debbie Gyke*

King Tut by *Kassandra Chamberlin*

Picasso by *Tricia Holbrook*

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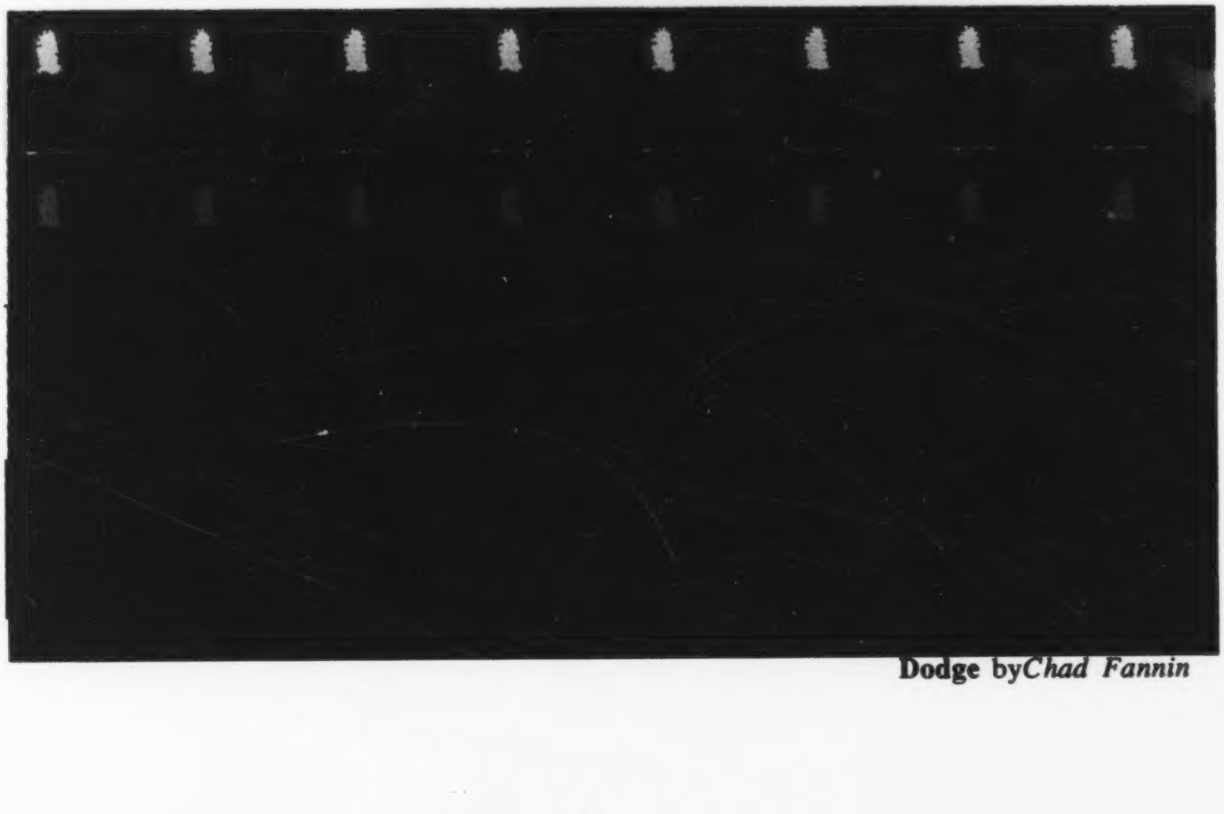
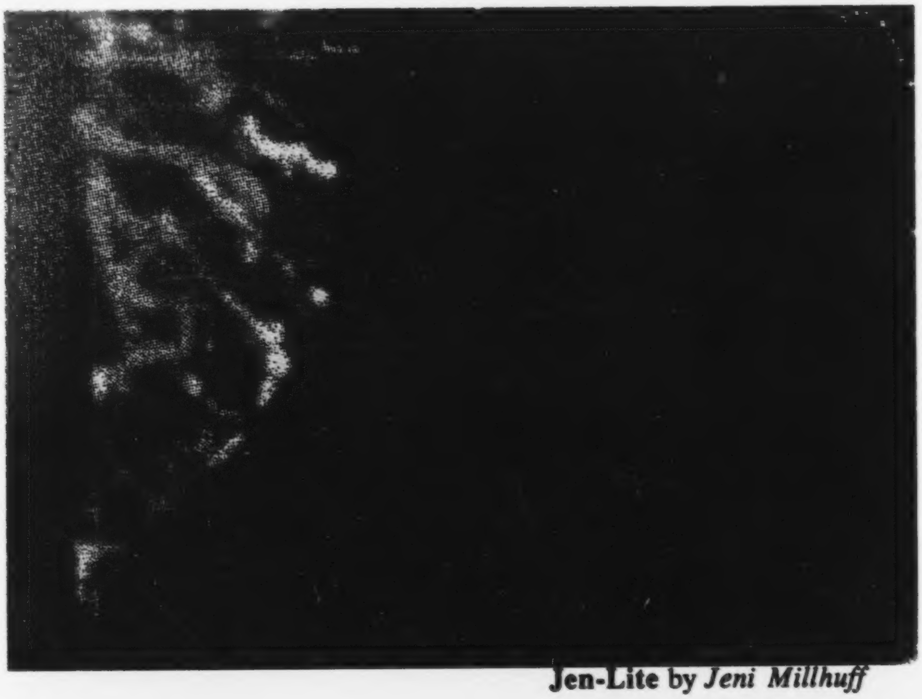
Self-Portraits

Self-Portrait by *Heather Cochran*



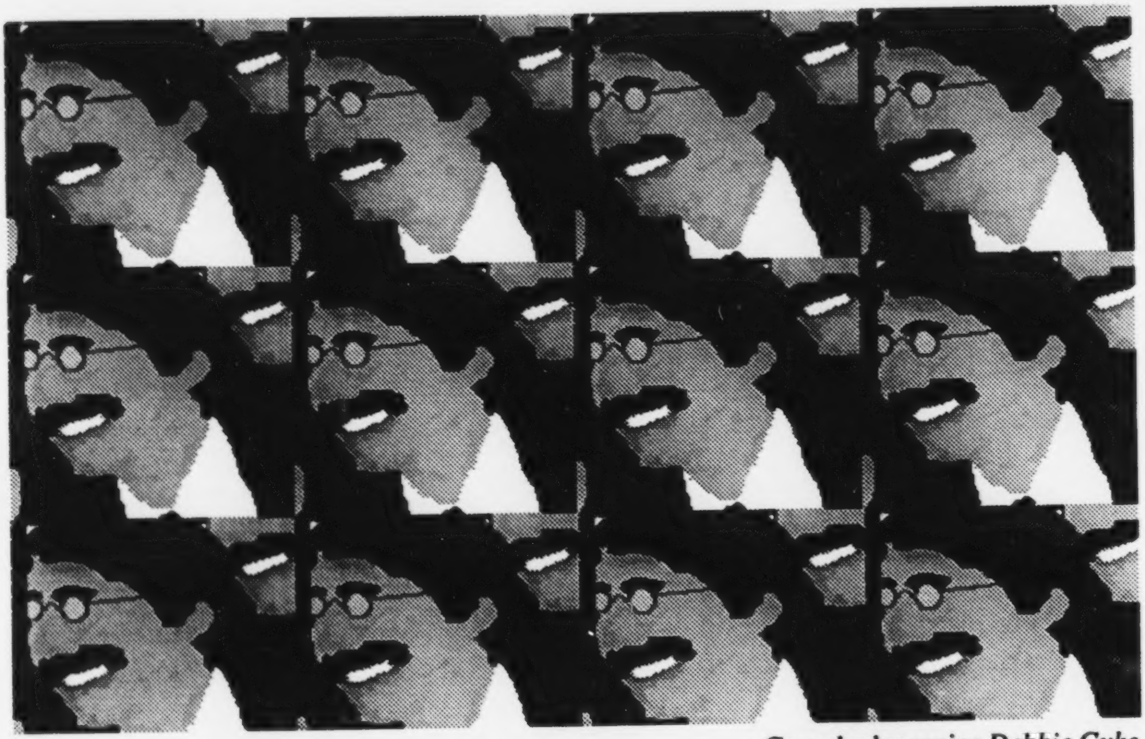
Dodge by*Chad Fannin*

Self-Portraits

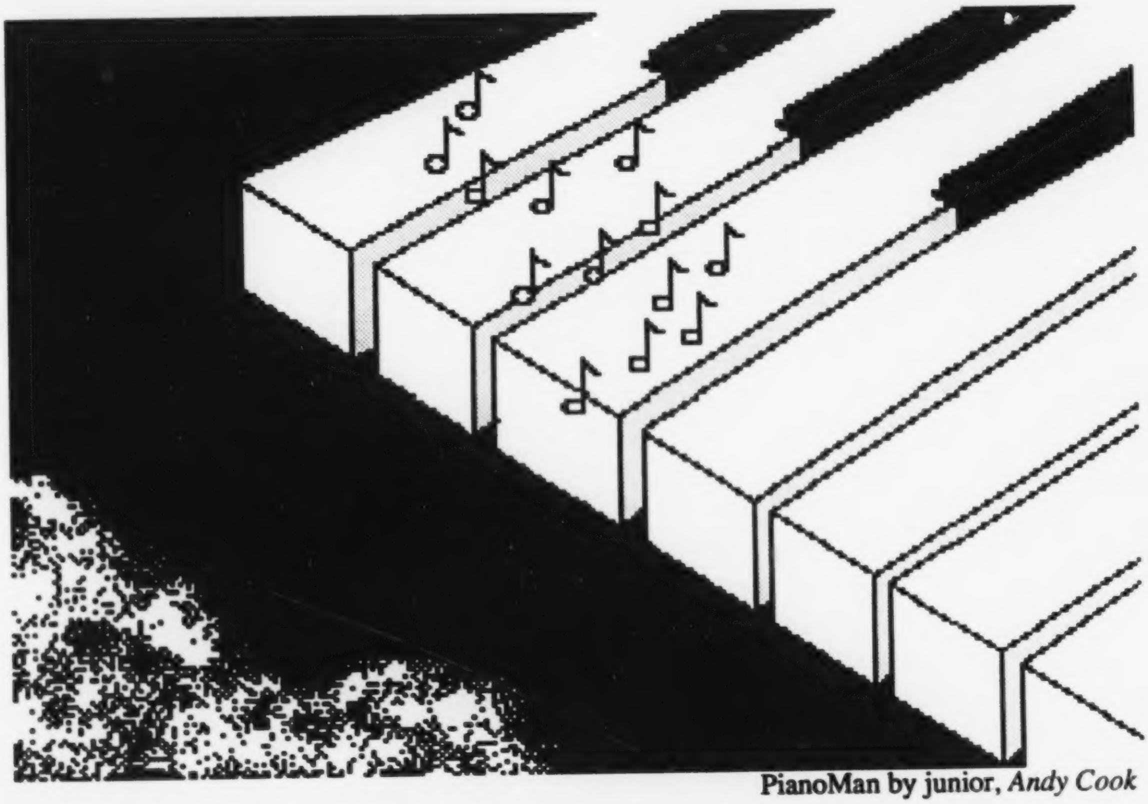


Jen-Lite by ***Jeni Millhuff***

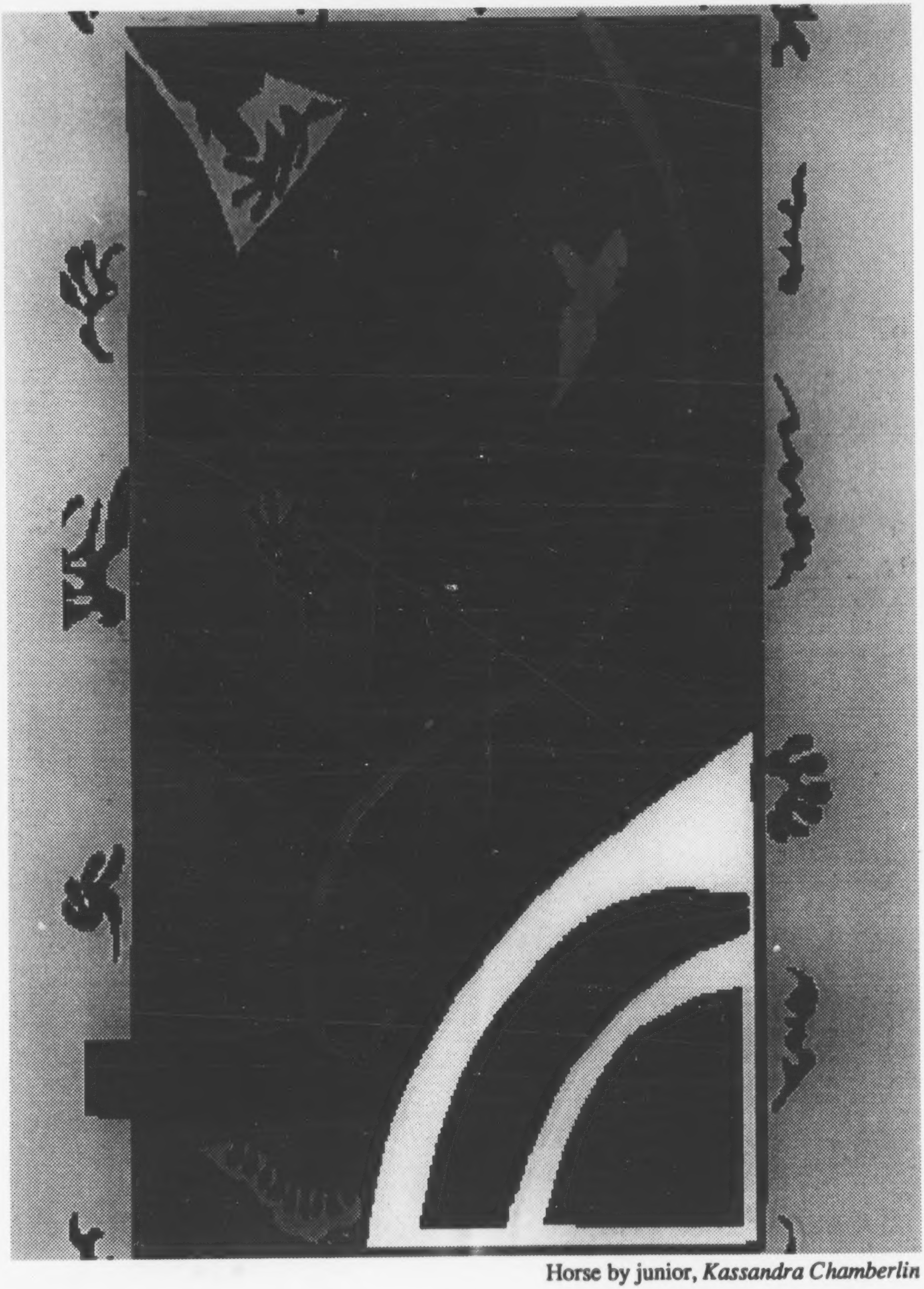
Dead Buzz by ***Ryan Bussey***



Groucho by senior *Debbie Gyke*



PianoMan by junior, *Andy Cook*



Horse by junior, *Kassandra Chamberlin*

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EVALUATION

In order to evaluate a program, several methods could be used to determine both individual student performance and overall program success. The very subjective nature of art makes it difficult to collect, record, and evaluate information for analysis. Therefore, more than one type of instrument could be used for obtaining the desired data. In fact, the results of a program of this nature do not lend themselves to objective analysis. Subsequently, subjective evaluative methods could be relied upon heavily.

Student Product and Performance Evaluation

To evaluate student performance both subjective and objective methods could be used. Some examples of each are listed. We have also included some forms that we have used for evaluation.

Subjective

--observation and performance evaluation checklists of student by instructor
--using the art criticism guide developed by Edmund Feldman, students will evaluate each other's art in critique form
--teacher rating of finished projects
--student self-evaluations
--individual student conferences
--evaluation panel of local art educators

Objective

--testing with objective questions
--completion of assigned projects
--computer art survey

Some Additional Considerations for Evaluation

--how to evaluate the product? from a hard copy or monitor?
--evaluate each project as a group or individual
--keeping track of individual student's time spent on computer projects
--Remember, computers may be a new medium, but if they are to be considered an artistic tool, the art generated must also stand up to conventional judgments

Content Evaluation

One instrument to evaluate program content could be the "Standard Guideline Implementation Checklist for Art Specialists in Ohio Schools". This form is currently used by Upper Arlington City Schools. (See following pages).

EVALUATION FORM
COMPUTER ART WORK

STUDENT NAME____________________

DATE____________________

1. ELEMENTS AND PRINCIPLES OF DESIGN

	P	F	G	VG	E
1) Use of line	1	2	3	4	5
2) Use of color	1	2	3	4	5
3) Use of texture	1	2	3	4	5
4) Use of value	1	2	3	4	5
5) Use of composition	1	2	3	4	5
6) Use of unity	1	2	3	4	5
7) Use of variety	1	2	3	4	5
8) Use of contrast	1	2	3	4	5
9) Use of pattern	1	2	3	4	5
10) Other	1	2	3	4	5

2. TECHNICAL SKILLS

1) Ability to save work	1	2	3	4	5
2) Ability to use software	1	2	3	4	5
3) Ability to scan & digitize	1	2	3	4	5
4) Ability to print	1	2	3	4	5
5) Ability to copy, paste & duplicate	1	2	3	4	5

3. PROBLEM SOLVING AND INVENTION

	P	F	G	VG	E
1) Image alteration & manipulation	1	2	3	4	5
2) Inventive use of media	1	2	3	4	5
3) Creative consolidation of techniques	1	2	3	4	5
4) New image generated	1	2	3	4	5
5) Recognize & explore the limits of computer art	1	2	3	4	5

COMMENTS:

VISUALLY GIFTED STUDENTS
EVALUATION FORM

NAME ______________________________

GRADE ____________________ DATE ____________________

NOTEBOOK ____________________

SIX WEEK'S PROJECTS ____________________

COMPUTER ART PROJECTS ____________________

TESTS ____________________

O=OUTSTANDING **A=ACCEPTABLE** **M=MINIMAL**

STUDENT'S SIGNATURE ______________________________

TEACHER'S SIGNATURE ______________________________

COMMENTS : ______________________________

TEACHER EVALUATION
STUDENT PERFORMANCE
CHECKLIST

I. MANIPULATION AND TECHNIQUES:

1) DEMONSTRATES ABILITY TO START-UP YES NO

2) USE OF MOUSE:

A) CLICK YES NO

B) DOUBLE CLICK YES NO

C) CLICK AND DRAG YES NO

3) USE OF KEYBOARD:

A) TEXT YES NO

B) SHORT CUTS

4) SAVE GRAPHICS:

A) HARD DISK YES NO

B) 800K FLOPPY YES NO

C) CONVERT AND CHANGE DOCUMENTS YES NO

5) SCANNER:

A) USE TOOLS YES NO

B) SET CONTROLS YES NO

6) COMPUTER EYES:

A) USE TOOLS AND SETTINGS YES NO

7) VIDEO CAMERA:

A) USE CONTROLS YES NO

8) PIXEL PAINT:

A) NORMAL TOOLS YES NO

B) SHORT CUTS YES NO

9) PRINT DOCUMENTS YES NO

10) SHUT DOWN YES NO

11) CARE AND RESPONSIBILITY OF EQUIPMENT YES NO

II. OBSERVATION OF PROJECTS

1) PROJECT #1

A) TASK COMPLETED YES NO

B) SELF-INITIATED IMAGE YES NO

C) USED PHOTO FOR SET-UP YES NO

2) THREE MASTERWORKS

A) ONLY CHANGED COLOR YES NO

B) IMAGE ALTERED YES NO

C) COMPLETELY CHANGED IMAGE YES NO

D) SELECTED DIFFERENT ARTISTS YES NO

3) SELF-PORTRAIT:

A) TRADITIONAL POSE YES NO

B) ALTERED IMAGE YES NO

C) COMPLETELY CHANGED IMAGE YES NO

4) KEPT LOG AND JOURNAL YES NO

5) DEMONSTRATES COOPERATIVE LEARNING YES NO

STUDENT'S NAME ______________________________

DATE ______________________________

STUDENT PROJECT EVALUATION FORM

PROJECT NAME

PROCEDURE (LIST THE STEPS IN DOING PROJECT)

PURPOSE (WHAT DID YOU LEARN? WHY DID YOU USE CERTAIN COMMANDS?)

IMPROVEMENTS

FUTURE CONSIDERATIONS

STANDARD GUIDELINE IMPLEMENTATION CHECKLIST FOR ART SPECIALISTS IN OHIO SCHOOLS

Checklist

Answer questions by checking the most appropriate box. Box number code is:

1. Always
2. Usually
3. Seldom
4. Never

The art specialists (certified art teachers and supervisors) in our district work together to meet the standards in these area

CURRICULUM	1	2	3	4	5
Establish principles, purposes, and expected learnings for each grade level in our plans.					
Plans the scope and sequence of learning experience in seeing, feeling, and expressing.					
Plan the scope and sequence of learning for understanding and evaluating electronic art.					
Establish the relation of studies in electronic art to other curricular areas.					
Determine methods of assessment and evaluation of program implementation for learning.,					
Establish expectations for students that contribute to awareness that their work in electronic art provides personal development.					
Establish expectations for students that contribute to awareness that their work in electronic art provides social recognition.					
Establish expectations for students that contribute to awareness that work in electronic art provides for their economic development.					
Prepare activities in electronic art production to stimulate spoken and written language expression.					

CURRICULUM	1	2	3	4	5
Prepare activities in describing and interpreting electronically generated images to increase ability for appreciating electronic art.					
Work to expose students to the study of electronic art from other countries to yield awareness that technology provides expression of human values and concerns.					
Prepare expressive electronic art activities for personal development to acquire powers of visual expression.					
Prepare responding electronic art activities for personal development to perceive and respond to the visual qualities of electronic art in the environment.					
Prepare expressive electronic art activities for awareness of art heritage and achievements of past and present artists including ways they expressed themselves.					
Prepare responding electronic art activities for awareness of art heritage to study critical and historical responses of scholars.					
Prepare expressive activities in studying electronic art in society to view ways images express shape, and reflect values, beliefs, and the conflicts of society.					
Prepare responding activities in studying electronic art in society to view ways that society responds to the visual imagery of this technology.					
Prepare expressive electronic art activities that include involvements to discover ideas, transform ideas, and use the computer.					
Prepare responding electronic art activities to include describing, interpreting, and judging artworks.					
Prepare expressive and responsive electronic art activities in the areas of production and identification of artistic subject, theme, medium, product, function, design, style.					

ORGANIZATION	1	2	3	4	5
Plan, implement, and evaluate the computer graphics curriculum.					
Promote program development and professional growth.					
Relate the computer art program to community life for the support of parents, officials, and community.					
Assume responsibility that learning and achievement in electronic art is recognized and rewarded in school and community.					
Encourage parents and citizens to become involved in the computer art program.					
Promote parity and continuity in the computer art program across all grade levels.					

Additional Comments:

ART CRITICISM

The four stages of art criticism according to Feldman are:

I. **DESCRIPTION** - a listing what an art object seems to be made of.

II. **ANALYSIS** - describing the relationships among the things that were listed.

III. **INTERPRETATION** - deciding what all your earlier observations mean.

IV. **JUDGMENT** - deciding the value of an art object.

Place the art object so it is clearly visible to every member of the group. Tell the group not to jump to any conclusions about the work. (This is most important.)

DESCRIPTION

The words you use in description are like pointers; they draw attention to something worth seeing. Remember, the words that you use must be NEUTRAL. In other words, do not use such terms as strong, beautiful, harmonious, weak, disorderly, ugly, funny-looking, etc. Terms that denote value judgments must be banned from your vocabulary at this stage as they are loaded and tend to influence your judgment too early in the game. Also remember that, if you are not certain what something in the work is, then do not assign a name to it. For example, it may not be clear whether you are looking at men or women. In such a case you should say you see "some people" . It is wise to be vague about some detail rather than to make an error that might throw off the final interpretation.

WHAT YOU CAN TALK ABOUT

1. In some descriptions, you can get agreement about the NAMES of what you see like a man, a tree, a lake, grass, children, animals, sky, and so on. Agreement is fairly easily accomplished when viewing traditional works of art. (For that reason, perhaps, exposing students to traditional works might be the best way to begin.)

2. Contemporary abstract and nonobjective works rarely show us things that have common or proper names, so we have to describe the shapes, colors, spaces, and volumes we see.

3. Use words that call attention to the specific properties of very general things like vertical, round, oval, smooth, dark, bright, square, horizontal and so on.

4. Now, combine the above adjectives with the general nouns like shape, space and volume and you add precision to your description of a work of art without judging or interpreting it too early.

5. Try to describe the way the art object seems to have been made. See if you can identify

what media and what tools were used and tell how they were manipulated to create the work. (Technique is important for criticism because it is just as expressive as the shapes and forms we see.)

REMEMBER, DESCRIPTION IS NEUTRAL SO WATCH YOUR LANGUAGE.

ANALYSIS

In this stage we want to find out what the forms do to each other -- how they affect or influence each other. Describing the relationships among the things we see is a process known as formal analysis.

THINGS TO LOOK FOR:

1. Size relationships. Comparative size is significant because it gives clues about importance (large shapes usually seem more important, they seem to have higher "rank" than small shapes). Look for the largest, the smallest, and those shapes that appear to be about the same in size. Size is also a clue to location in space if you are looking at a picture in which spatial depth is represented.

2. Shape relationships. By studying how shapes are combined in a work, you can acquire valuable evidence for deciding what the total work of art means. Try to analyze what happens when curved shapes are next to each other, or when they are next to square or pointed shapes. Notice how jagged shapes offset smooth ones. Look at the edges of shapes and see if you can describe them as being hard or soft, even or uneven.

3. Color relationships. Notice whether the colors of relative shapes are similar to or different from each other; whether they vary slightly or contrast strongly. Look for value relationships -- analyze whether a color area is lighter or darker than a nearby area. You may discover that colors are different while the values are the same.

4. Textural surface relationships. Notice whether the textural treatment is actual and/or illusionary. Notice whether textural surfaces of relative shapes are similar to or different from each other; whether they vary slightly or contrast strongly. Through analyzing the surface qualities of a work of art, you may discover the emotional qualities as well as the ideas conveyed by the art object.

5. Space and Volume relationships. When analyzing a painting, look for clues to the location of forms. Notice which forms appear in the foreground of the picture plane. Notice which forms appear in the background. Describe how the artist implied space, (e.g. through the use of perspective, overlap, size, placement, color, light and shadows, etc.). Notice whether the implied space is indefinite, seemingly open and endless, or whether it has limits and is enclosed. Pay attention to the empty spaces -- negative shapes -- and see if you can determine their effect on the positive forms or volumes that constitute the work of art. The way a sculptor, painter, or architect treats negative space may offer useful clues to the total meaning of his work.

67

THE INTENTIONS OF DESCRIPTION AND FORMAL ANALYSIS ARE:

a. To encourage as complete an examination of the object as it is possible for the viewer to make.

b. To slow down the viewer's tendency to jump to conclusions.

c. To help build skill in observation -- a skill that is vital for understanding the visual arts as well as for general personal development.

d. To accumulate the visual facts that will form the basis for a critical interpretation.

e. To help the group establish a consensus about which features of the art object constitute the subject of interpretation and judgment.

INTERPRETATION

Finally, you have arrived at the stage when you have to decide what all your earlier observations mean. This takes courage so don't be afraid to make a mistake. You may find that you change or adjust your interpretations until it fits the visual facts. The beginner often finds that he makes a number of errors so don't feel too badly if you fall short of the mark on your first try. Be sure that you do not, however, try to change or ignore visual facts in order to make your interpretation seem correct.

SUGGESTIONS FOR INTERPRETING A WORK OF ART

1. See if you can describe a single large idea or concept that seems to sum up or unify all the separate traits of the work. NOTE: Do not describe the object (you have already done that). Use words now to describe ideas.

2. Explain the sensations and feelings you have when viewing the art object.

3. Drawing on your own artistic experience, see if you can recognize some technical signs that indicate that the artist is trying to solve a certain problem that you might have struggled with yourself.

4. Drawing on your knowledge of art history and artistic styles try to identify problems that artists have persistently tried to solve such as problems of meaning or form or social function.

5. Trust yourself -- your observations, your hunches, and your intelligence. Sometimes, impressions may come to you in the form of "looks like" and "feels like" reactions. These reactions may be funny, illogical or absurd, but do not reject them. Sometimes "way out" impressions can be sharpened to the extent that they offer some fundamental insight about the work being viewed.

(If you have been able to let a thing -- an art object -- enter your life and become part of you, if your mental and emotional powers have transformed that thing -- that work of art -- so that it is yours in a very unique and special sense, then you have discovered what it is like to have an AESTHETIC EXPERIENCE.)

JUDGMENT

The reasons for judging a work excellent or poor have to be based on a philosophy of art, not on a man's personal authority. If you are resourceful, however, you can develop your own philosophy of art as a basis for judging the merit of any work that interests you. Perhaps, if you have not yet developed a philosophy of your own, you will consider one of the following to help guide you in making your final judgment about works of art. Feldman identifies and describes three philosophies of art that seem useful for justifying critical judgments. They are:

I. FORMALISM - stresses the importance of the formal or visual elements of art

II. EXPRESSIVISM - stresses the importance of the communication of ideas and feelings in a convincing and forceful manner.

III. INSTRUMENTALISM - stresses the importance of the social intention of the work.

FORMALISM

1. The formalist critic wants the experience of art to be devoted to contemplation of the relationships of the parts to the whole in a work of art.

2. Each part should enhance the quality of the parts around it.

3. It should not be possible to change a single element without changing and therefore spoiling the whole work of art.

4. The viewer should not be aware of too much or too little of any emotion or sensation as he experiences the work of art.

5. The Formalist critic wants pleasure in art to come from the art object itself -- its surfaces, its colors, its stimuli, and combinations of sensations.

6. The Formalist critic would tend to appreciate "art for art's sake" and feel that no other reason is necessary or even acceptable.

7. Feelings and ideas should depend only on the way the artist shapes his materials.

8. Art that relies on symbols, or on subject matter, or on the viewer's experience is rejected by the Formalist critic.

9. A masterpiece, according to the Formalist critic, is a work of art that has perfect visual organization and technical execution.

EXPRESSIVISM

1. The Expressivist critic is concerned about the depth and intensity of the experience he has when he looks at art.

2. An excellent work of art could even be ugly.

3. The Expressivist critic feels the formal and technical organization of the work has to be good, otherwise it would not be able to affect his feelings.

4. Basically, the Expressivist critic has two rules for judging excellence:

   a. The work is best which has the greatest power to arouse the viewer's emotions, and
   b. That work is best which communicates ideas of major significance.

5. Art should look and feel as if it is based on reality, not other works of art.

6. Great art should not look calculated; it should seem to be the inevitable result of what an artist has seen or felt deeply.

7. The Expressivist critic believes that art should make everyday life more meaningful and profound.

8. The genuineness or actuality of the artist's emotions does not matter. What matters is the artist's ability to make the viewer believe in what he sees. (The viewer has to feel emotion before he will believe that the artist also felt and expressed it.)

INSTRUMENTALISM

1. The Instrumentalist critic believes that art should serve purposes that have been determined by persistent human needs working through powerful social institutions. (Art should serve the interests of the church, the state, business, or politics.)

2. Art is at its best when it helps to advance some cause that will, presumably, advance the interests of humanity.

3. Art that depends on art or grows out of art is decadent.

4. The excellence of a work of art is measured by its capacity to change human behavior in publicly visible ways. (Great political art results in greater allegiance to a part, etc.)

5. The technical and imaginative gifts of the artist need to be organized by an idea that is greater or more important than the private emotions of the artist.

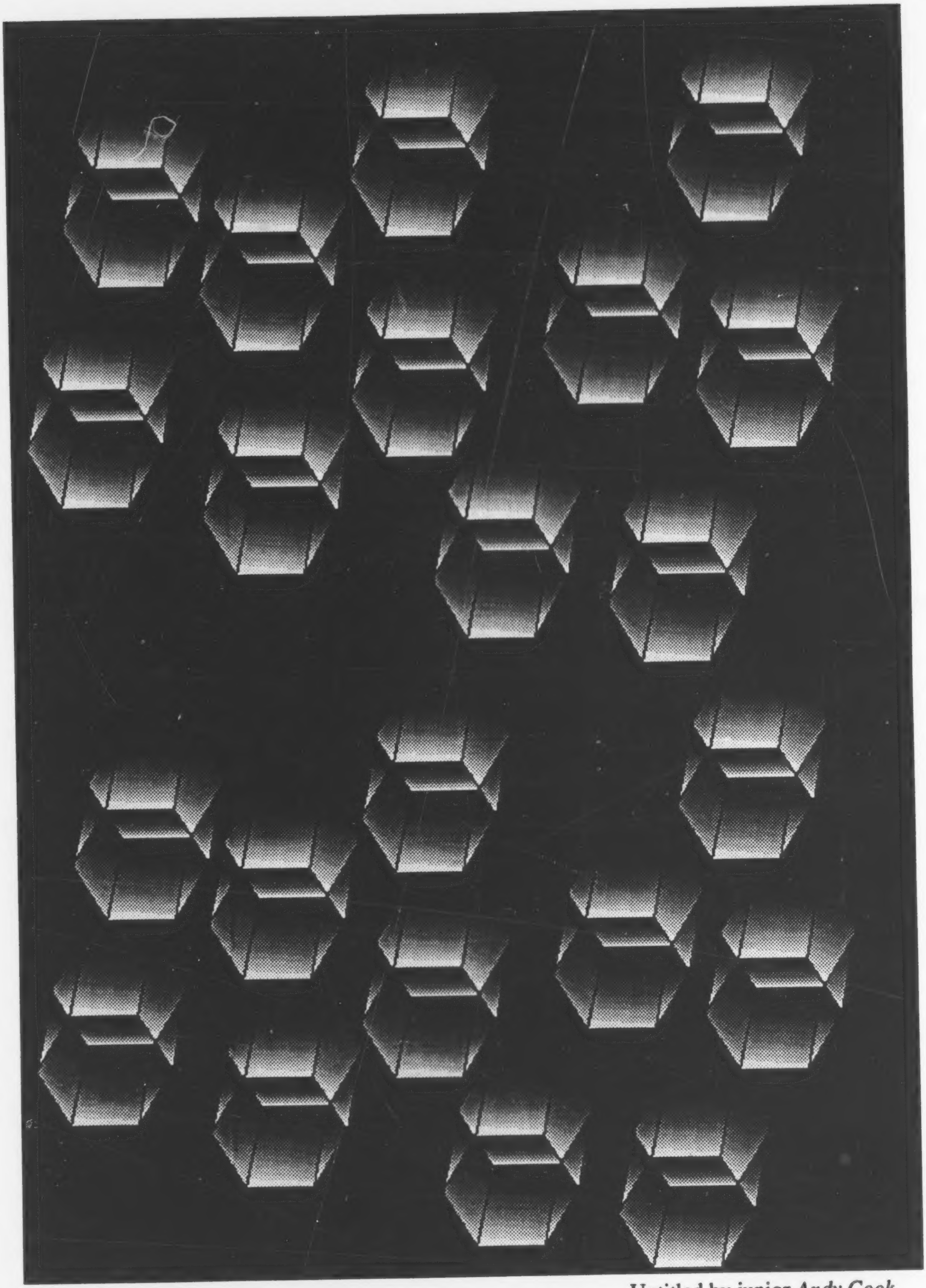
6. The Instrumentalist critic believes that, if the meanings of the work are good and are

good and are expressed through perfectly organized forms, then the work is a masterpiece. ("perfectly organized forms" means that the closest possible connection between the appearance and the social intention of the work.)

A FINAL WORD OF ADVICE

Do not start the examination of a work of art by asking whether it meets your conditions for excellence. That is the last question you should ask. Begin with identification and description and work your way through analysis and interpretation. By then you will know which type of judgment which philosophy of art, is most appropriate for the work you are examining. It is better to use these philosophies interchangeably, according to the character of the art object, than to stick rigidly to one philosophy alone and thus lose discovering some excellence the work may have. The goal of art criticism is not necessarily to demonstrate how consistent you are in your final judgments. The real goal is to increase the sum of values and satisfactions you can get from art.

Feldman, Edmund Burke, Becoming Human Through Art. Englewood Cliffs, New Jersey: Prentice-Hall, 1970, pp. 348-383.



Untitled by junior *Andy Cook*

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REFERENCES

The following references will help provide several resources and technical data for building or starting a computer art program. The resources are geared towards Macintosh computer-based systems, but may be explored in different hardware and software applications.

The specific hardware and software that we are describing have been used for the past two years in our grant. One may find that some models and programs are out-dated, but welcome in the world of computers, where system configurations are changing monthly as well as software updates.

The books, magazines, and articles are oriented for the visual arts and gifted educator. We hope they are helpful.

Hardware :

We selected Apple Computer, more specifically (4) Macintosh II cx computers with 4MB of RAM and 80 MB Hard Disk. An Apple Scanner, HP Paint Jet Printer and our Apple Laser Writer II NT. Our video equipment includes (1) NU Vista+ 2MB Video Overlay Board which is installed in the C.P.U. and a Panasonic S-VHS Camcorder model PV-575S.

At the time of purchase, these computers were considered the latest equipment, but today they are somewhat outdated. However, they will certainly serve our needs.

There were three reasons for selecting Macintosh:

1. The availability of a certified Apple dealership for service and maintenance.
2. The association with Dow Chemical Co.
3. The ease and flexibility of using the Macintosh Computers.

We realize that every educational situation is different, and budgets are limited. Perhaps, one can afford at least one work station with similar equipment. For the most part, the equipment has proven to be quite reliable and easy to maintain. Keep in mind, we are not using super computers; we are using great personal computers that have high resolution graphic capabilities. The skills, knowledge, and adaptabilities are universal. That is, the skills and fundamentals that we are teaching will be used in higher more sophisticated equipment for post-secondary experiences.

Some other things to consider are:

--Is there a consultant or computer specialist in the school district?
--Ability to purchase additional equipment and software updates?
--Is there equipment in the school already for use?

--Do you have enough space in your art room?
--How will you integrate computers into the curriculum?
--Where and when will the class be taught?
--How many students test in and what are your class sizes?
--Where will the computers be located?
--Do you need a printer? Dot Matrix? Color? Laser?
--Who is responsible for maintenance?

Hardware:

Hardware includes the CPU and monitor.

The Macintosh is easy to use, has memory expansion capabilities, excellent graphics, and a high resolution monitor. Costs are coming down especially with the introduction of the Classic, LC, IIsi, and the Mac is finding its way into local school districts at a phenomenal rate. The MacII CX has an Apple 13" color monitor with wonderful color capabilities. The most popular use for the Mac in society today is in Desktop Publishing.

Monitors:

With the Mac, the Apple family is sold with a monitor. Be sure to check for an 8*24 Bit Video Display Card to run Pixel Paint Pro Software. When doing animation, check for a multi-sync monitor for capturing and video overlay. Princeton Graphics ULTRA 12 has the multi-sync capabilities.

Printers:

Presently, we are using the following printers:

ImageWriter II with color ribbons
HP Paint Jet Printer with interface and cables
Apple Laserwriter II NT for black and white desktop publishing

Dow Chemical has provided the NEC Color Laser Printer for our use.

Also, you may check local businesses and printing shops for Linotronic Printers or Canon Color Copiers for Macintosh.

Another possibility is to make slides from your monitor and produce color prints. The following is a list of equipment needed:

35 mm Camera with tripod
A zoom or Macro lens
200 Speed Ektachrome at f/4
Cable Release

*Turn out all lights in room to remove reflections.

INPUT DEVICES

Mouse

The Macintosh system comes with a mouse and almost all software is designed for the mouse to be used. The trackball was not a good choice for drawing or painting, but proved to be very helpful in word processing. The Graphics tablet or Kurta Board with a large surface is great for intuitive drawing and free expressive work. But it takes exploration and practice to control the cursor and pen.

Video Digitizers

Several digitizers are available, we are using both black and white and Color Computer Eyes. The only difference is that the black and white version has an extend box and color version installed in your CPU. If you are using a standard video camera, you may want to buy an extra long cord to hook up for different views. Also, make sure you use a tripod for stability.

SOFTWARE

The following list of software is currently being used in our Computer Art Program. A brief description will help you decide on what to purchase. Make sure your hardware is compatable. The system configuration is important along with memory requirements and cables for video equipment.

Software has a user's manual, but we only use it as a reference. We prefer exploration and experimentation with actual demonstrations, although some companies are releasing training videos for additional help wich may prove helpful.

PIXEL PAINT

PIXEL PAINT 2.0 Pub: SuperMac

A color painting program. It provides a palette of nearly 1.6 million colors at once. Create images with brush or pencil strokes or import scanned images, add special effects, manipulate size and shape. Requires an 8-bit video card. Will run on 1MB MacII but really need minimum of 4MB to do the most work.

PIXELPAINT

PIXEL PAINT PROFESSIONAL Pub: SuperMac

Color painting program to take advantage of Apple's new 32-bit QuickDraw software. It includes all the features of the 2.0 version but does things not possible in 8-bit color such as anti-aliasing for smooth edges, realistic airbrush and color mixer.

COMPUTER EYES Pub: Digital Vision

Captures video images and converts them to digitized graphic files. It accepts any standard NTSC video signal. Will capture an image in about 6 seconds, and will save files in PICT and TIFF in black & white and color.

ALDUS FREE HAND 2.0

Computer drawing software. Its features include a blending tool, autotrace, ruler guide, customizable patterns and a knife tool. It displays in color and has flexible editing and text handling

SWIVEL 3-D Pub: Paracomp

A fast 3-D color drawing and modeling program for the Mac. It rotates and places objects in a 3-D framework. Swivel 3-D animated sequences can be used in MacroMind Director.

MACRO MIND DIRECTOR Pub: MacroMind

Animation software. It combines text, graphics, animation, audio and video to create multimedia presentations.

HARDWARE FOR PROGRAM

MACINTOSH II CX COMPUTER ($4,500.OO)

APPLE SCANNER ($2,000.00)

PANASONIC S-VHS CAMERA ($2,000.00)

HP PAINTJET PRINTER ($1000.00)

APPLE LASERWRITER II NT PRINTER ($3,000.00)

* ALL PRICES ARE ESTIMATES .

YOU MAY CHECK FOR EDUCATIONAL DISCOUNTS FROM BUYING GROUPS.

OTHER RESOURCES

The following resources will provide access to additional materials necessary for establishing a successful computer art program.

These resources are oriented towards Macintosh Computers and High School Art Activities.

MAGAZINES

School Arts
Art and Man
Arts and Activities
Computer Graphics
Electronic Learning
Computer
Mac User
Insider
Family Office
T.H.E. Journal
Gifted Child Today
Teacher
Media and Methods
Mac World
Art in America
Art Forum
Art News
Time
Life
Discover
Omni
Smithsonian

ORGANIZATIONS

Ohio Art Education Association

National Art Education Association

Ohio Department of Education

Jerry Tollifson
State Art Education Consultant
Ohio Department of Education
65 South Front Street
Columbus, OH 43226-0308

NCGA (National Computer Graphics Association)
2722 Merrilee Drive
Suite 200
Fairfax, VA 22031

> **NCGA** is an organization of graphic artists. Like **SIGGRAPH** , the **NCGA** sponsors a conference and exhibition. Special attention is given to computer graphics for animation. Tapes of this exhibition are available.

SIGGRAPH
Association for Computing Machinery
11 West 42nd Street
New York, NY 10036

> **SIGGRAPH** started in 1966 as a Special Interest Group on Computer Graphics of the Association of Computing Machinery (ACM). It provides an organization for artists who create visual images using a computer. **SIGGRAPH** sponsors an annual summer technical conference which includes an art show of juried works created by members. 35mm slide sets of these works are available from: **SIGGRAPH**
> P.O. Box 64145
> Baltimore, MD 21264

VIDEOTAPES

Deakin, Michael and Leslie Megahey, prod .VHS. *Painting with Light*. Pacific Arts Video, c1986.

deValois, Geoffrey, prod. VHS. *Computer Dreams*. n.d.

Dupont, Colyer, prod. VHS. *Computer Magic*. c1990.

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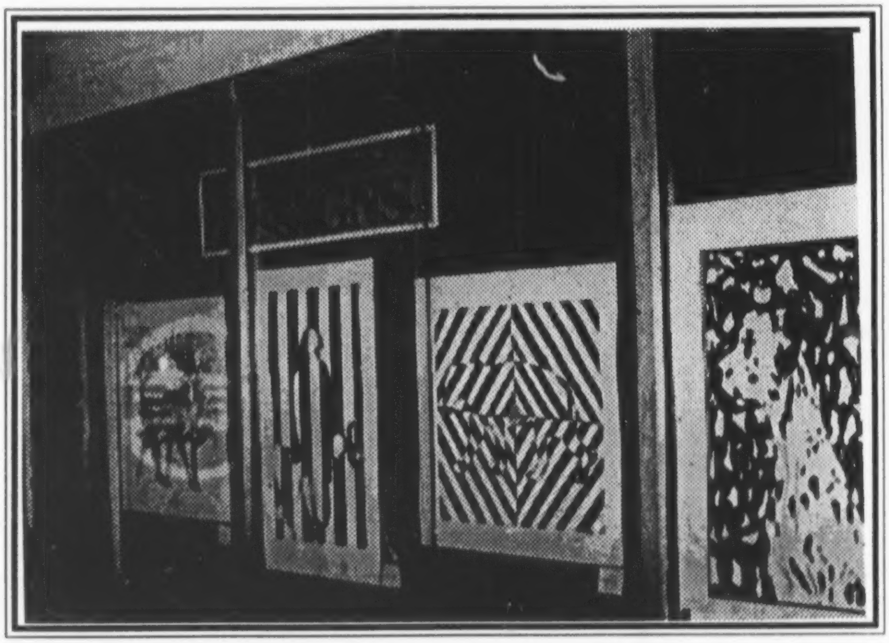
Untitled by Trish Holbrook

SUMMARY

During the past two years, several things have evolved from our grant for visually gifted students. These experiences have been positve and have complemented the total school system.

- extended computer art program to junior high and elementary school
- display cases, computer cabinets, and additional exhibition materials purchased by local board of education
- program developed for engineering graphics and CAD at the high school using similar equipment
- student from program , working part-time at local newspaper
- students participating in mentorship experiences with computer art and design involving professionals in their fields
- field trip to The School of the Art Institute in Chicago
- billboard design and sponsorship of Dow Chemical Co.

This photo shows part of the display cases that were installed and purchased by the school for exhibiting art projects in the cafeteria.



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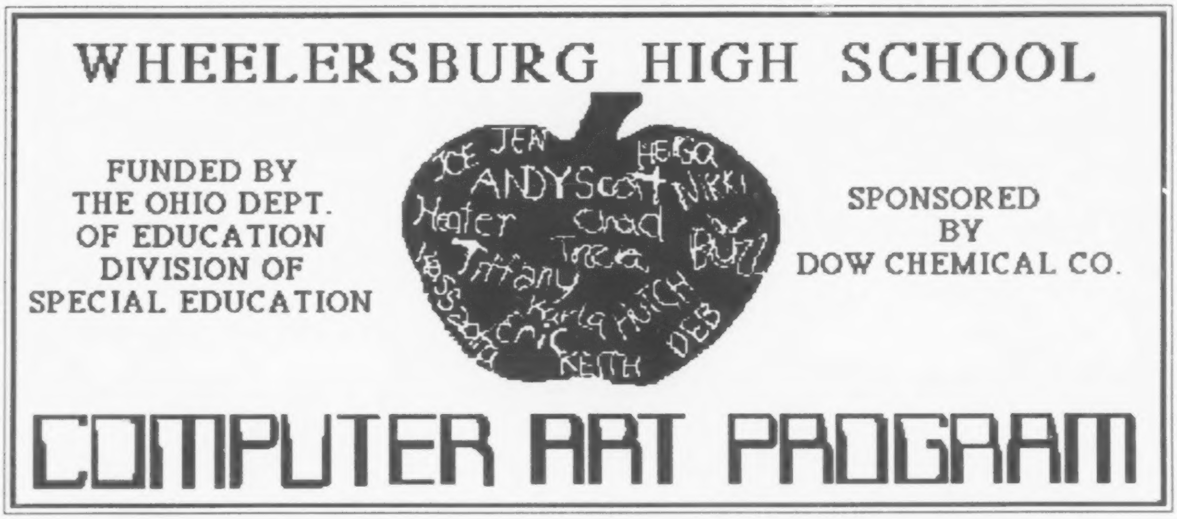
Art Instructor, Tom Suter, his wife, son, student teacher, and computer art class to visit Heather Whitman in Chicago.

She was an art student at Wheelersburg High School who is attending The School of the Art Institute of Chicago.



WHEELERSBURG HIGH SCHOOL

FUNDED BY
THE OHIO DEPT.
OF EDUCATION
DIVISION OF
SPECIAL EDUCATION

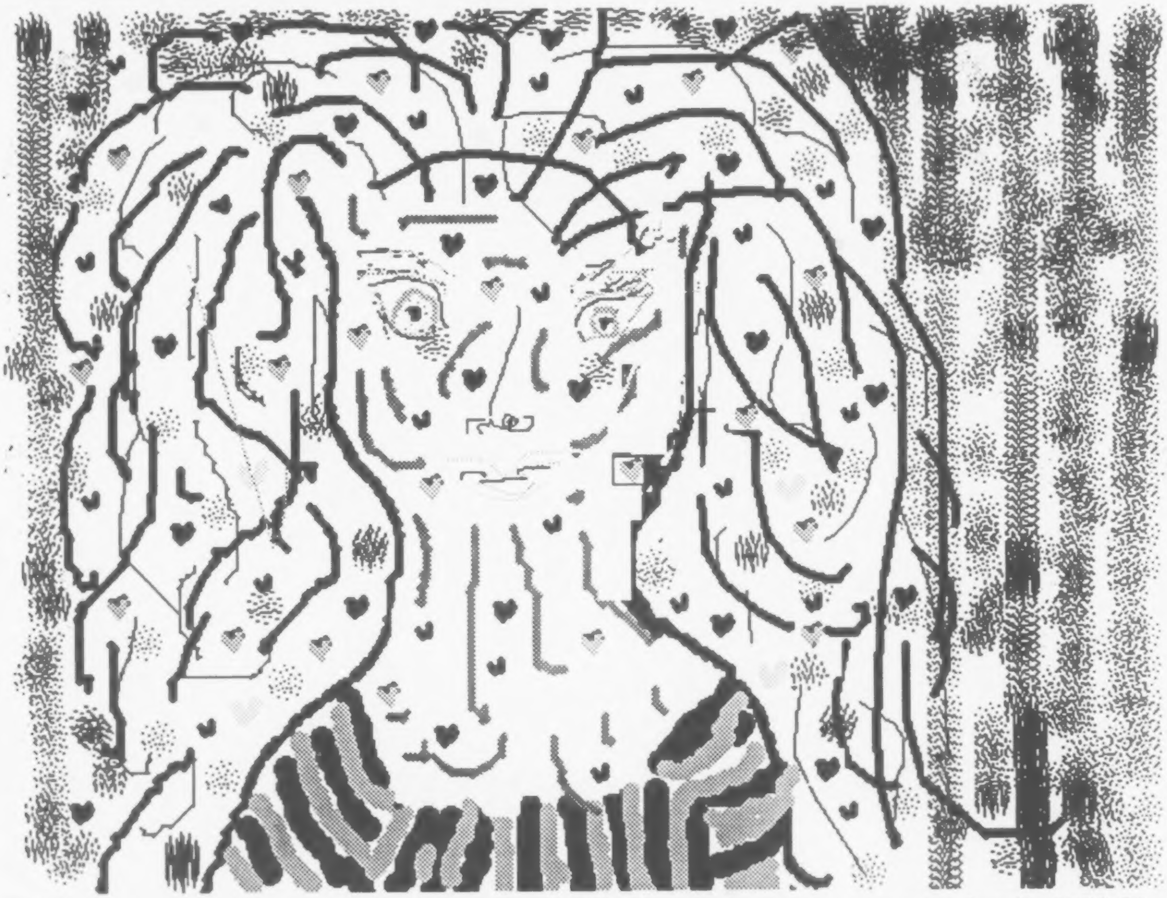
SPONSORED
BY
DOW CHEMICAL CO.

COMPUTER ART PROGRAM

JOE
JEN
HELGA
ANDY
Scott
NIKKI
Heater
Chad
BUZZ
Tiffany
Treca
Karla
HUTCH
DEB
Eric
KEITH

A picture of the actual billboard design was displayed along a main roadway near Wheelersburg.

Ryan Bussey, a junior and second year computer art student, is working part-time at *The Daily Times* , one of our local newspapers, using a Macintosh computer. He has made plans to serve his mentorship with a graphic design firm this coming school year that also uses the Macintosh computer.



This computer art piece, entitled *HER*, by Jeni Millhuff, a junior, won an art award at the 1990-91 Regional Scholastic Art Competition in Cincinnati, Ohio.

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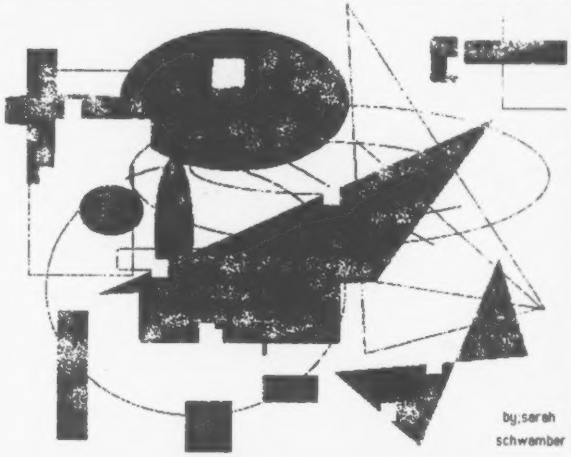
The following computer art images are some examples of the junior high and elementary program.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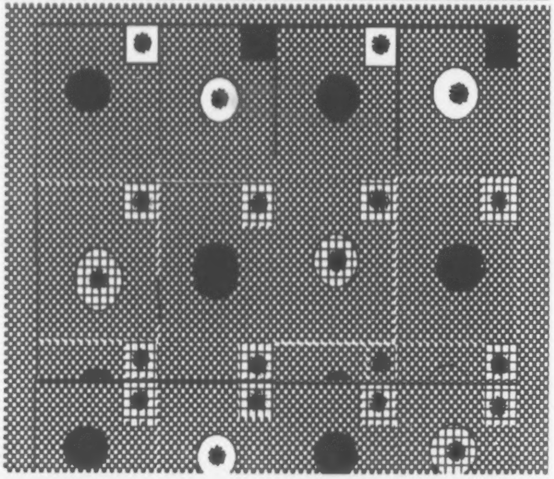
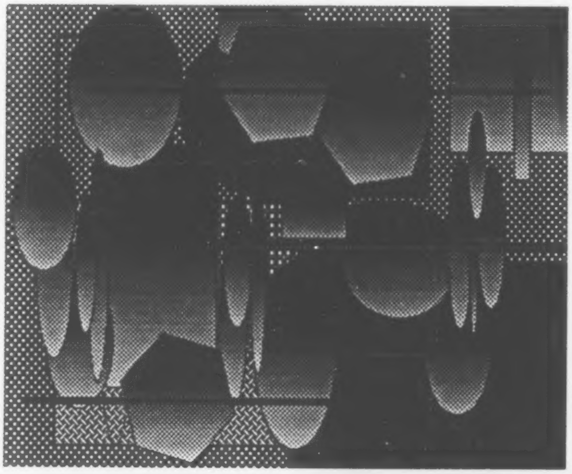
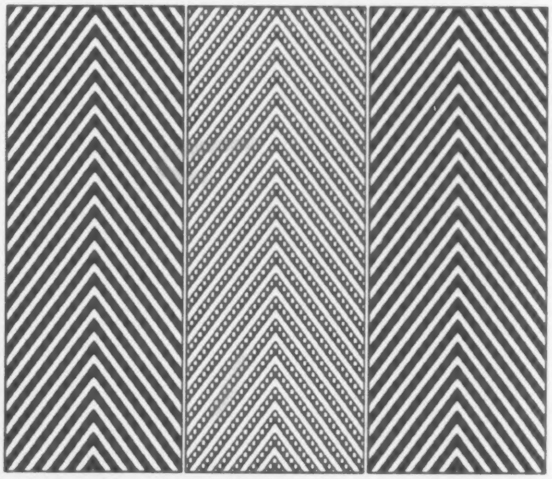
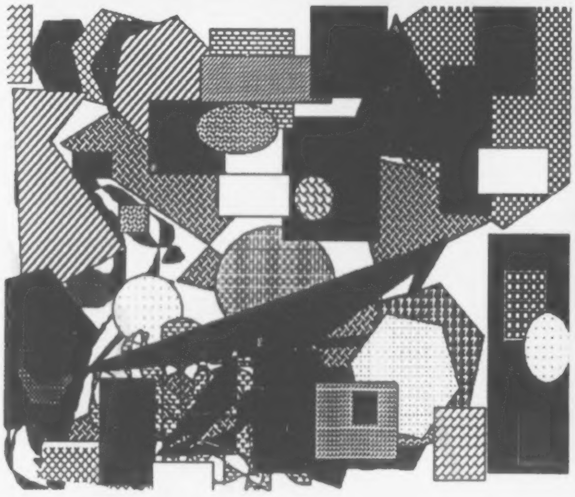
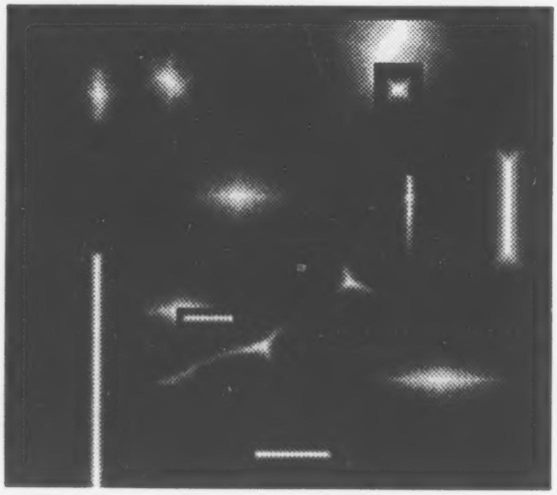
schwamber

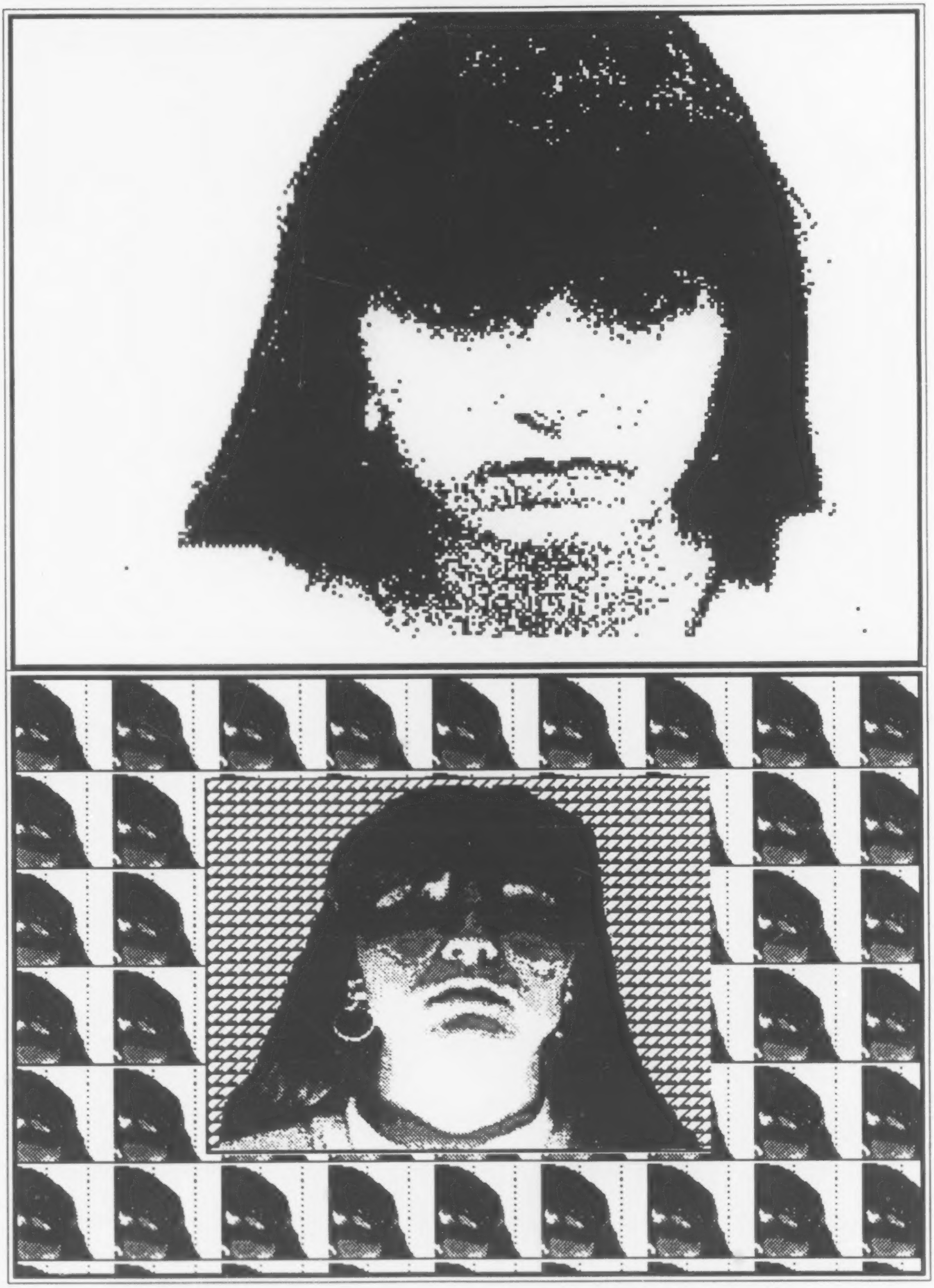












Two Self-Portraits by junior *Heather Cochran*

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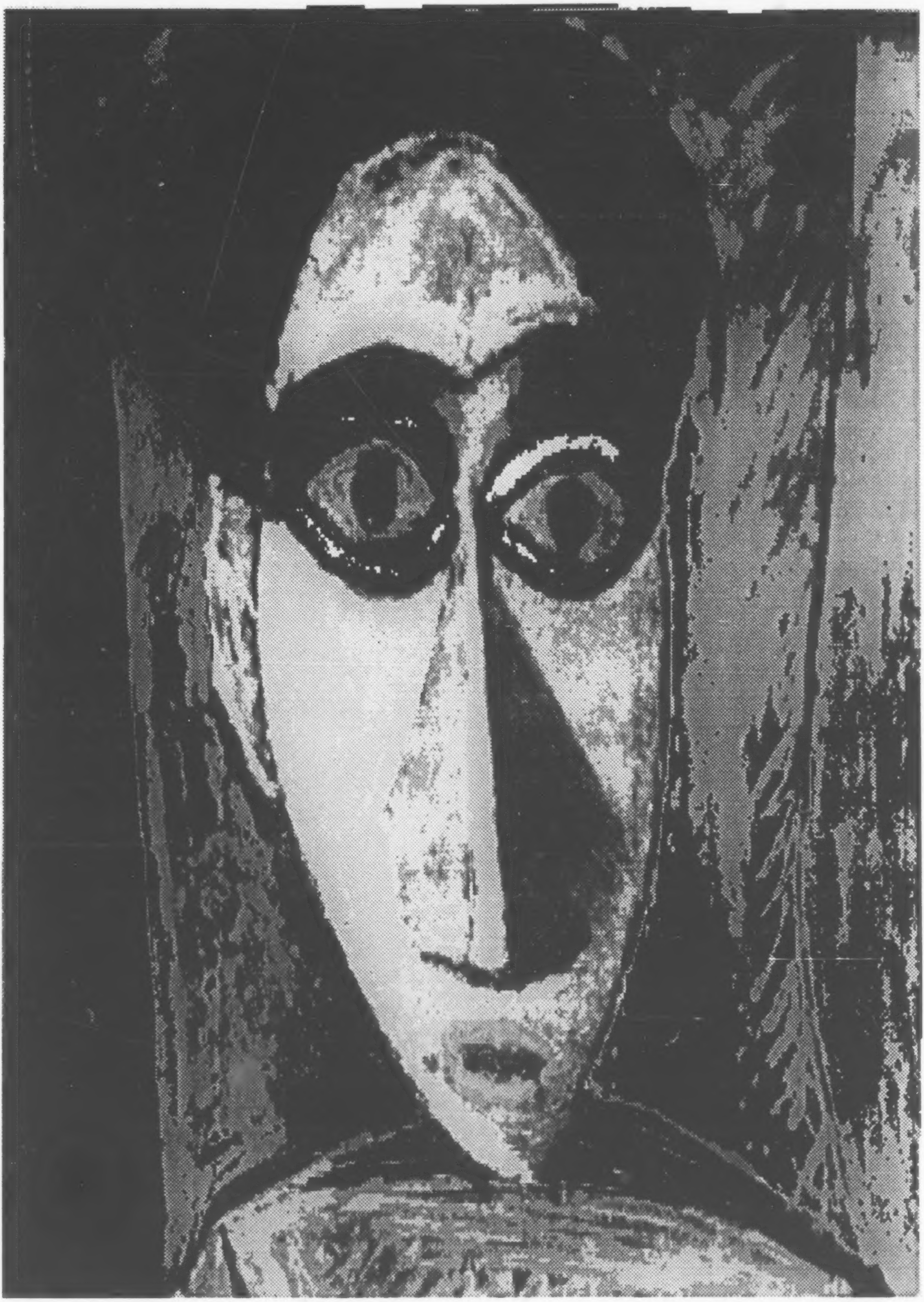

Woman by junior *Jeni Millhuff*

BEST COPY AVAILABLE

GLOSSARY

access: retrieval of information from a storage medium (such as computer disk, optical disk or tape).

additive color: a color theory that defines color as projected light. Color on a video monitor is created by beams of light produced by electron guns.

adjacent colors: a color scheme based on a set of colors located next to one another on the color wheel.

aesthetics: the beauty in art that reflects the balance, harmony and rhythm of the elements in a composition. The aesthetic creates an emotional and physiological response in the viewer.

aliasing: undesirable visual effect in computer generated images most commonly a stepped edge or staircase along the object boundary.

analog: characteristic of varying continuously along a scale. Videos are analog devices versus computers which are digital.

animation: the act of giving motion to art, typography, and/or three-dimensional objects. To animate on a computer display requires the system to paint pictures rapidly so that the eye perceives changes of motion.

anti-aliasing: software programs written to correct the stepped appearance of diagonal and curved lines on a raster display. The technique involves averaging intensities between neighboring pixels to soften the stair-step effect.

Apple DOS: brand name for Disk Operating System for Apple personal computers.

application software: a program that puts the resources and capabilities of the computer to use for some specific purpose or task such as word processing, database management, graphics, or telecommunications.

ascenders: the vertical portion of a lower case character, which extends above the body of the letter such as in "d", "f".

assemblage: combining elements into a visual composition.

authoring system: permits non-programmers to use the computer to design programs or interactive courseware.

background: parts of an image that will be overlaid by objects designated as foreground. Sometimes the background has different color choices than the foreground.

back-up: an extra copy of information stored on a disk. If the program or other data stored on the first disk becomes damaged, it is still available on the backup copy.

basic: beginner's All-purpose Symbolic Instruction Code; a high level programming language designed to be easy to learn and use.

baud rate: a measure of the speed at which computer information travels between a computer and a peripheral or between two computers. A baud is equal to one bit per second.

binary: the representation of numbers in terms of powers of two, using the two digits 0 and 1. Commonly used in computers, since the values 0 and 1 can easily be represented in physical form in a variety of ways, such as the presence or absence of current, positive or negative voltage, or a white or black dot on the display screen.

binary file: a file containing raw information not expressed in text form.

bit: the smallest possible unit of information on computers.

bit-mapped: describes a type of screen in which each pixel is assigned a location in memory, making high-resolution graphics possible.

boot: to start up a computer by loading a program into memory from an external storage medium such as a disk. Often accomplished by first loading a small program is to read the larger program into memory.

brush: a drawing tool (small shape, point, or line) that lets the user create strokes of varying sizes, widths, colors, and patterns.

buffer: an area of the computer's memory reserved for a specific purpose, such as to hold graphical information to be displayed on the screen or text characters being read from some peripheral device. Often used as an intermediary holding area for transferring information between devices operating at different speeds, such as the computer's processor and a printer or disk drive. Information can be stored into the buffer by one device and then read out by the other at a different speed.

bug: an error in a program that causes it not to work as intended.

byte: a unit of information consisting of a fixed number of bits; on the Apple IIe, one byte consists of eight bits and can hold any value from 0-255.

cables: used to connect various peripheral devices to the computer in order for these devices to communicate with the computer.

CAD/CAM: Computer Aided Design/ Computer Aided Manufacturing. The terms cover a wide range of systems that expedite mechanical or electronic designs.

CD: Compact Disk; 1 4 3/4 inch laser-encoded optical storage disk used to store audio or visual images in digital form.

CD-ROM: Compact Disk/Read Only Memory; a 4 3/4 inch laser-encoded optical storage disk. CD-ROM refers to those disks used for storage rather than the audio disks. Information cannot be altered.

chip: a wafer of silicon containing thousands of integrated circuits.

chroma: a subjective term which usually refers to the difference of hue from a gray of the same value. A degree of change relative to the purity of a color.

color: in computer graphics software, color is specified in different ways. Some systems identify color by hue, value, and chroma or saturation. Other systems use the additive color system and specify color by the percentages of red, green, and blue.

color wheel: a two-dimensional model organizing color in which all of the intense, saturated colors are place around the perimeter of a circle with red at the top, yellow at a quarter turn, green at the bottom and blue at three quarters turn. Proportional mixtures of these primary colors are located in between the parent colors.

collage: the combination of varied images, i.e. drawn, video digitized, textures and typography.

compiler: in order to program a computer there must be a language compiler or interpreter in the computer that translates the statements written by the programmer into machine code so that the computer can operate on the program instructions.

composite video: a video signal that combines the red, green, blue and sync components of a color video signal into one signal.

computer graphics: graphic images displayed on a computer screen. Graphics include line drawings, illustrations, pictorial images, charts, graphs or diagrams, or a combination of these.

configuration: arrangement of a computer system and various peripheral devices.

command: a communication from the user to a computer system (usually typed from the keyboard) directing it to perform some immediate action.

complementary colors: refers to opposite colors. In an additive system (light) the complements combine to produce white. In subtractive (pigment or other colorant) system complements combine to produce a neutral gray.

computer: an electronic digital machine capable of storing, processing, and retrieving data.

computer language: a method of instructing a computer, a set of commands for programming a computer to perform a specific task. Popular languages include: LOGO, BASIC, Pascal.

computer system: a computer and its associated hardware, firmware and software.

control key: a special key used in combination with other keys to send pre-coded commands to a running program.

copy: an editing command frequently a part of graphics programs that allows the user to define a section of an image and duplicate it onto another part of the screen.

copy-protect: to prevent the copying of information recorded on a storage medium, such as a disk containing software sold as a commercial product.

CPU: central processing unit

CRT: cathod ray tube; a TV like screen which produces an image by directing a beam of electrons to activate the phosphor coated surface of the tube used for display of programs or pictures.

cursor: a small marker or symbol displayed on the screen used to position text or other elements on the screen.

data: information; especially information used or operated on by a program; usually on a second diskette rather than on the program diskette, and referred to as data diskette.

debug: to find and correct any errors in a computer; to find and correct any mechanical failures within a computer system.

descender: a dangling part of a lower case letter. Many dot matrix printers are not capable of printing descenders.

desktop publishing: the formatting of text, creation of page layouts and/or use of graphics within a document for presentation using a "desktop" computer system.

desktop video: using a "desktop" computer, the creation of animation and/or graphics or fine art works for self-contained presentation, or for transfer to video.

device: equipment that connects to a computer system to expand the capabilities of the computer.

digital: data in the form of discrete digits or increments as opposed to analog.

digital photo: pictures in a digital format that are created using a video digitizer or optical scanner.

digitize: to turn a drawing or diagram into a set of coordinate points.

digitizing pad (tablet): a pad so constituted with a touch sensitive surface, that the position of a stylus or electronic pen touching the pad is sent to the computer.

digitizer: transforms analog information into digital information.

DIP switches: a series of toggle switches built into peripheral devices such as tablets that are used to encode various types of information such as baud rate, DIP switches must be set to match the configuration of equipment.

disk: an information storage medium consisting of a flat, circular magnetic surface on which information can be recorded in the form of small magnetized spots, similarly to the way sounds are recorded on tape. Diskette refers to smaller (5 1/4") flexible disks.

disk drive: a peripheral device that can store and retrieve information on a disk. A dual disk drive refers to two drives.

display: refers to the visible picture on the display tube or hard copy.

dithering: a technique which creates better graphic images by the intricate juxtapositioning of dots of light, to soften an edge or visually smooth a jagged line.

documentation: the instruction manual which accompanies a software package, input device, or hardware.

DOS: acronym for disk operating system

dot matrix printer: an impact printer that creates letter forms or graphics with small wire pins that strike the ribbon. The resulting characters are composed of small dots.

drag: on a graphics display, to move a part or all of an image using a cursor, tablet, pen or other positioning device.

DVI: digital video interactive; use of compact disc with a drive that allows for, not only visual, audio and text information, but also full motion video.

edit: the ability to change all or part of an image.

embossed image: an image impressed into soft paper. This can be done using a printer without a ribbon.

eraser: in some graphics programs, that allow drawing on the screen with a pen or brush shape which deletes images over which it is moved.

error message: a message displayed or printed to notify the user of an error or problem in the execution of a program.

electronic pen: a stylus used with a digitizing pad or light pen to send positioning information to the computer.

electronic publishing: the use of computers for the design, layout and typesetting of various publications.

expansion slot: an area of a computer into which additional equipment may be inserted.

fax: facsimile technologies allow information (written or drawn on paper) to be transmitted over telephone lines.

fiber optics: technology and use of glass fiber strands/cable capable of transmitting information.

film recorder: a peripheral device which reads the digital information from the computer and translates it directly to film to be printed as a hard copy slide or print.

file: a collection of information stored as named unit on a peripheral storage medium such as a disk.

fill: the ability of a graphics program to make all the dots in a bounded area a new color with a single command.

floating images: images or portions of images that can be moved around on the screen and synthesized with other images using a mouse or stylus on a tablet. These images may be transparent or opaque.

floppy disk: a thin, flexible disk of plastic with a magnetic coating used for data storage. The usual sized for small computers if 5 1/4 " and3.5".

font: complete set of characters and symbols that make up one size of a typeface.

format: 1) the form in which information is organized or presented; 2) to specify or control the format of information; 3) to prepare a blank disk to receive information by dividing its surface into tracks and sectors; also called initialize.

frame: a complete image displayed on the face of a CRT or produced by the camera.

frame buffer: a separate memory or area of main memory which stores the displayed image as a matrix of bits. If the frame buffer has 3 bits per pixel then each pixel can have up to 8 intensities or colors.

frame grabber: video digitizer that captures an image, translates it into a digital data set and communicates it to the display screen.

freezeframe digitizing: a video digitizing process in which an image is captured with a video camera, translated into a digital set and communicated to the computer graphics system for display on the screen. This is an instantaneous process analogous to taking a snapshot.

friction feed: paper is held in the printer by pressure.

function key: a special key on a keyboard which sends a pre-coded message to a computer.

genlock: a circuit which permits the mixing of the video signal from a computer with the input from a video camera. Genlock is necessary for superimposing computer graphics onto video images.

gestalt: the synthesis or grouping of elements visually that creates a composition.

gesture sensing device: a device that can sense the location and movement of a hand or arm.

glitch: an informal name given to lines which seemingly "squirt" from a drawn area.

grid: a regular pattern of intersecting lines usually at right angles, which divides the screen's drawing space into small regions. It may be used as a visual aid during drawing and may or may not become part of the final image.

hard copy: printed copy of computer's output.

hard disk: a rigid record shape of metal platter coated with magnetic recording film which stores data. It has greater storage capacity that floppy disks. The platter is contained and cannot be directly accessed by the user.

harmony: a pleasing relationship between the elements in a composition.

hardware: physical equipment of the computer system; electronic, magnetic or mechanical or combination thereof.

high contrast: refers to film art which eliminates the intermediate values of the gray scale.

high-resolution graphics: (Hi-res) 1) the display of graphics on the Apple IIe's display as a six-color array of point, 280 columns wide and 192 rows high; 2) According to industry wide graphics standards high resolution is considered to be 1024 x 1024.

hue: another name for color.

hypercard: software developed by Apple for use with the Macintosh which allows the user to create and link multiple sources of information.

hypertalk: authoring language of hypercard.

hypertext: an approach to information management of not only text, but video and audio as well.

hypermedia: a way to create and access large multimedia information sources or databases; usually includes the interaction of videodisc and hypercard stacks.

icon: an image, figure, likeness or a representation of an object or event. Used in computer programs they represent applications, functions or files.

image field: the area occupied by a computer graphic image, similar to a piece of drawing paper or a canvas.

image processing: the transformation of an image through a variety of techniques. Images can be colorized, stretched, compressed, cut apart, rearranged, distorted, superimposed on other images and blended together in various ways.

imaging: the process of creating unique visual and sound images using a variety of computer related devices and software.

impact printer: a printer that prints by mechanically striking an inked ribbon.

in-betweening: development of frames of animation that are in between the key frames.

initialize: 1) set to an initial state or value in preparation for some computation; 2) to prepare a blank disk to receive information by dividing its surface into tracks and sectors; also format.

ink jet printer: a non-impact printer, whereby the print head has small cartridges of ink that squirt the ink onto the paper.

input: the transfer of data into the computer.

input devices: light pens, graphics tablets, keyboards, touch sensitive screens, joysticks or any device used to give a computer alphanumeric or graphical data.

input scanner: a digitizer that scans a flat picture and translates it into a digital data set. This is similar to a copy machine.

integrated circuit: IC; also known as a chip, this is a group of interrelated circuits (electronic components) in a single package.

integrated software: software that has been written to run with and complement other software; i.e. Aldus Group - Freehand, PageMaker; and PrePrint.

interactive computing: each entry by the user results in a response from the computer; a dialog between the user and the computer.

interface: any device, rule, or convention which links two pieces of hardware allowing one component of a system to communicate with another.

interlacing: scanning technique which first sends the even then the odd lines of a display in the refresh cycle.

interlaced video: the way in which the video display is scanned or refreshed by the electron beam in the video tube. In interlaced video the screen is divided into two fields, the odd number lines and the even. The picture on the screen is continually refreshed by this scanning pattern. Interlaced video can appear to flicker when used with some computer graphics systems.

I/O: input/output; the transfer of information into and out of a computer.

jaggies: a term for the jagged edges formed on a roster scan display when showing diagonal or curved lines.

joystick: a lever-like device used to transmit positioning information to a computer.

K: abbreviation for kilo or kilobyte; refers to memory size.

keyboard: a part of the computer which resembles a typewriter whose keys are used to communicate with the computer.

language: in computers, a particular set of symbols used to communicate between a computer and the program being used.

laser: Light Amplification by Stimulation of Emission of Radiation.

laser disc: a high density storage device that can store numerous pictures. These pictures can be retrieved rapidly in any order and displayed on the computer screen.

laser printer: a non-impact printer whereby the image is made by a laser beam that traces an image onto paper that attracts a toner to make a print of the image.

letter quality printer: an impact printer which produces documents in much the same fashion as a typewriter; one type is a daisy wheel printer.

load: to transfer information from a peripheral storage medium (such as a disk) into main memory for use.

lock: to protect a disk file from being changed or erased.

logo: a high level language designed to make programming easy.

lower case: uncapitalized letters.

low resolution graphics: (lo-res) on the Apple IIe and IIc, divides the screen into 40 columns and 48 rows; each coordinate appears as a small rectangle on the screen. Sixteen colors are available in low-res.

luminance: refers to the degree of brightness on a monitor screen.

megabyte: approximately one million bytes.

menu- driven: a program that functions as the user selects options from a menu or list of options. Selections are made by moving the cursor to the desired junction on the menu. The cursor is moved using a mouse, stylus, tablet or a light pen.

MIDI interface: Musical Instrument Digital Interface. A standard interface for connecting music devices to the computer.

memory: any location either temporary or permanent which stores information on a computer system until needed.

main memory: the memory component of a computer system that is built into the computer itself and whose contents are directly accessible to the processor.

menu: a display of possible options presented by the program, usually on the display screen, from which the user can select.

microcomputer: a computer whose processor is a microprocessor; may be 8, 16, or 32 bit. Sometimes referred to as a personal computer.

microprocessor: a computer processor contained in a single integrated circuit. The central processing unit of a computer.

mirror: a selection as part of some

graphics programs that allows the user to have strokes made on one section of the display mirrored exactly on the other half of the screen (top, bottom, left or right) or all four sections.

modem: modulator/demodulator; a peripheral device that enables the computer to transmit and receive information over a telephone line.

monitor: a video display used for displaying text or graphics for a computer system.

mouse: a hand-held input device that is used to move the cursor around on the display screen and to choose options from a menu.

network: an interconnected system of computers and/or other devices. The components do not have to be physically close to one another and are often connected by telephone lines.

non-impact printer: printer in which the print head makes no physical contact with the paper, i.e. ink jet, laser or thermal printers.

NTSC: National Television Standards Committee. Standard television signal in the U.S. It has a 525-line scanning system.

object-oriented graphics: computer graphics software that understands objects in terms of basic shapes. This software allows artists and designers to create shapes and forms with smooth, accurate curves and polygons.

operating system: software that oversees the overall operation of a computer system.

output: information transferred from a computer to some external destination, such as the display screen, a disk drive, a printer, a plotter or a modem.

paint system: a color graphics software/hardware system that allows the artist to draw freehand directly into the computer which is displayed on the CRT.

palette: the range of colors available in a computer graphics system. The number of colors that can be displayed simultaneously on the screen may or may not include the entire palette.

parallel: two or more things happening at the same time.

pen plotter: a pen drawing device that constructs diagrams. This is a hard copy peripheral capable or producing color or black and white line drawings.

peripheral: at or outside the boundaries of the computer itself; either physically (peripheral device) or in a logical sense (peripheral card).

peripheral card: a removable printed-circuit board that plugs into an expansion slot (such as in the Apple) or expands or modifies the computer's capabilities by connecting a peripheral device or performing some subsidiary or peripheral function.

peripheral device: a device, such as a monitor, printer, drive, etc. used in conjunction with the computer.

personal computer: a general purpose computer that is inexpensive enough to be owned by an individual.

pixel: an abbreviation for picture element or the smallest dot that can be displayed on the screen. The more pixels per screen, the finer the images that can be drawn.

plasticity: the malleability of shapes.

port: an input/output connection between a computer and its peripherals.

power supply: component of the computer system that supplies the appropriate voltage to the computer.

presentation graphics: graphics intended to present information, i.e. business charts. Usually considered to be a high quality image.

pressure sensitive tablet: a digitizing tablet that sensitive to pressure. A blunt stylus or one's finger can be used to draw and sketch with this table.

primary colors: a set of colors from which all other colors can be derived, but which cannot be produced from each other. The additive primaries (light) are red, green and blue; the subtractive primaries (colorant) are yellow, magenta and cyan.

printer: an output device that produces a printed copy of the information generated by the computer. A line printer prints a whole line of text at a time. A serial printer prints one character at a time.

printout: a printed copy of the information produced by the computer.

processor: the hardware component of a computer that performs the actual computation by directly executing instructions represented in machine language and stored in main memory.

program: an ordered set of instructions to be followed by the computer to accomplish a specific task.

proportional spacing: printing in which the width of the characters is determined by the shape of the character itself; i.e. the letter "i" is narrower that the letter ""w"" and therefore takes up less space on the page.

pull down menus: menus in which key words are displayed at the top of the screen. When desired the menus can be "pulled down" for full viewing.

RAM: Random Access Memory; often used to indicate the size of memory available for user programs.

raster graphics: a form of graphics in which the picture is built up by controlling the intensity or color of densely space discrete picture elements or pixels.

rays: a feature in some graphics packages that allows the user to draw multiple lines that emanate from a single point.

real time: data is processed quickly enough to control, direct or affect the outcome of some current activity or process.

refresh cycle: refers to requirement that pixels in raster graphics must be refreshed at least 30 time per second for a steady picture, since the light from the phosphor decays rapidly.

resolution: fineness of detail described by the number of visible distinct dots which can be displayed in a given area on the screen.

R F modulator: a device that converts computer signals to radio signals so that the computer output can be displayed on a television screen.

RGB: red, green, blue; refers to color monitors that project colors with three separate guns of each of those three colors.

ROM: Read Only Memory; memory that already has programs or data permanently assigned to it. Cannot be altered or added to.

rotate: an option in some computer graphics programs that allows for an object to be turned around its central point or axis.

rubber banding: a technique for moving one end of straight line, box, circle, or other shape on a display while the beginning point remains fixed.

run: have the computer execute the instruction in a program.

saturation: a subjective term that refers to the intensity and purity of a color. The addition of a color's complement lessens the intensity of the color. In additive color system, the color become lighter, with the subtractive color system the color becomes darker.

save: to transfer information from main memory to a peripheral storage medium for later use.

scaling: a function that enlarges or reduces the size of an element by a constant value.

scan: to analyze data; an optical scanner turns an image into digital form for input into the computer.

scanner: a device that turns an image into digital graphics form for input to a computer.

scanning: refers to the movement of the electronic guns in a monitor as they move left to right, creating a long string of glowing spots.

scroll: to change the contents of all or part of the display screen by shifting information out of one end to make room for information at the other end.

sector: a portion of the recording surface of a disk consisting of a fixed fraction of a track.

serial: things occurring one after the other. A serial interface is one that sends out one bit at a time.

slide: in computer graphics, a single video image. Images may be combined to make a complete slide show.

soft copy: computer information not on paper, data displayed through a monitor.

software: those components of a computer system consisting of programs that determine or control the behavior of the computer.

sound digitizer: a device that captures any sound and translates it into a digital format allowing a composer to work with the sound and use it to create electronic music.

storage: computer memory.

stylus: a pen device used in conjunction with a digitizing tablet. The stylus moves the cursor around on the display screen.

subtractive color: two colors or pigment combined to create a third.

sync: abbreviation for synchronous; refers to data transmissions based on a regular time interval.

syntax: within a computer language, syntax is the structure of its instructions. Syntax error occurs when instructions are incorrectly entered for the computer to interpret.

system: a group of integrated procedures or methods united to accomplish a set of specified objectives.

stretch: to elongate or shorten an object or region of a drawing.

tablet: input device that allows the artist to use a pen call a stylus for drawing and sketching.

three-dimensional digitizer: a stylus on a cable connected to the computer that records the location of points in space and communicates them to the computer

telecommunication: transmission of signals over a distance

text: a portion of a program using words, aside from the graphics used.

texture: a cross hatch, speckle or other pattern which may be used to fill an area in a graphics program.

thermal printer: a printer that prints by applying small points of heat to a specially treated heat-sensitive paper.

tile: in an oversize illustration, the portion of the page that is printed on a single sheet of paper. To make the complete illustration the tiles must be assembled.

3-D: three-dimensional; graphics which show height, width and depth.

3-D modeling: geometric description of an object using polygons or solids in three dimensions.

toggle: to switch between two stable states.

track: a portion of the recording surface of a disk consisting of a single circular band at a fixed distance from the center of the disk.

trackball: a positioning device that looks like a ball in a holder. The cursor moves as the ball is rotated or twisted by finger manipulation.

tutorial: a type of educational software program that gives instruction.

2-D: two-dimensional; ordinary plane, one surface graphics which allows for height and width.

undo: an editing feature, part of a program that allows the user to take back the last action.

upper case: capital letters.

user friendly: refers to programs that eliminate jargon and complexity, providing instructions or prompts for performing most operations on screen.

utility program: a program which performs special tasks as part of an operating system.

value: refers to the degree of lightness and darkness of a color.

vector graphics: a form of graphics in which the picture consists of line segments

video disc: used to store information; large capacity (54,000 frames)

video monitor: a display device capable of receiving video signals by direct connection only.

video overlay: ability to capture a video signal and overlay graphics or text; output to videotape.

video signal: the signal necessary for generating a picture on a television or video monitor.

video teleconferencing: a communications network that can include multiple parties that can be seen and heard through video monitors.

virus: affect hard disk performance; must be removed by "disinfecting" the hard disk with the proper software. Two well known viruses are Trojan horse and W. D. E. F.

volatile memory: memory in the computer that is sustained by electrical power. When the power is turned off, the information in the computer memory is lost.

window: a computer display screen.

windowing: apparent movement of the viewing area across a larger internal image area.

wire frame: display of a 3-D object as a framework consisting of line segments defining its boundaries.

word processing: the process of creating written documents.

work station: configuration of computer equipment designed to be used by one person at a time.

write-enable notch: the square cutout in one edge of a 5.25 diskette jacket or the slide tab on a 3.5 diskette which permits that disk to be written on.

zoom: apparent movement of the picture closer to or away from the observer. When a section of an image is brought closer or enlarged, it can be edited more easily b pixel.

COMPUTER ART TERMINOLOGY

BASIC

1. BITS : Binary digit - the smallest unit of information read (used) by computers.

2. BYTE : A sequence of bits (usually 8) grouped into a basic unit of information, such as a letter or number.

3. DIGITAL COMPUTER : A computer that uses numbers to perform logical and numerical calculations.

4. DATA : Information. Graphics images are stored and manipulated by computer in data form.

5. CHIP : A tiny flat rectangle capable of containing thousands of bits of information; also called the microprocessor.

6. CURSOR : A positionable pointer on the graphics monitor.

MEMORY

1. MEMORY : Space in computer used to store sets of instruction and data.

2. K : Shorthand for 1000, usually refers to bytes of memory.

3. RAM : Random Access Memory - Memory accessible to user for files & computing.

4. ROM : Read Only Memory - Memory with fixed usage, usually programmed with instructions at factory, not available to the user.

STORAGE

1. FILES : A system of organizing information (images, for example) that is analogous to traditional filing systems.

2. FOLDER : A place for documents to be stored on a hard disk.

3. DOCUMENT : text and or graphics kept in a folder.

4. BUFFER : A temporary storage area which holds information during transmission between components of system.

STORAGE DEVICES

1. FLOPPY DISK : Record-like device which allows instant access to information stored on any area of the disk.

2. HARD DISK : Similar to floppy, but larger, faster and more expensive (also, new hard disks for micros).

3. OPTICAL DRIVE

4. VIDEOTAPE

5. REMOVABLE HARD DISK (on cartridges 44 or 88 MB)

TYPES OF ART COMPUTERS

1. MICROPROCESSORS/PERSONAL COMPUTERS : Use-specific, portable, one person computers, with limited memory and speed.

2. SUPER COMPUTERS : Very powerful and expensive computers, many times faster than mainframes, usually dedicated to a specific use in which great speed and/or capacity are needed.

SYSTEM CONFIGURATIONS

1. HARDWARE : A general term referring to any piece of computer equipment.

2. C.P.U. : Central Processing Unit, where computing is done; the brains of the computer.

3. EXTERNAL DISK DRIVE : Device which reads a disk (information storage device) like a turntable reads grooves on a record.

4. INTERNAL DISK DRIVE

5. GRAPHICS BOARD (COLOR CARD): A printed circuit board which greatly determines graphic capabilities and image quality.

   a. GRAPHICS CONTROLLER:
   A chip which helps control and manipulate the image on the screen.

   b. FRAME BUFFER OR DISPLAY BUFFER :
   Stores data to maintain current monitor image, also temporarily saves changes of the image.

c. BOARD DETERMINES :

1. RESOLUTION :

A measure of the ability to display detail expressed in pixels per screen. (usually 640 x 480).

PIXEL :

Picture element, the smallest unit of display.

2. COLOR

3. 8 BIT COLOR

4. 24 BIT COLOR

3. KEYBOARD

4. MONITOR : Similar to TV screen, monitors display alphanumerics (words and numbers) and/or images. The monitor is used in computer graphics as the visual equivalent of an artist's canvas.

a. RASTER :

A type of monitor which works similar to a TV screen continually scanning the image area in horizontal lines.

b. VECTOR :

Calligraphic or stroke based monitor systems which draw lines of an image point to point according to mathematical descriptions.

5. MODEM : Interface between computer and telephone, allowing data to be sent over telephone lines.

INPUT DEVICES :

Devices which are used to put data into the computer. Graphic input devices are used to create images visible on the monitor. The monitor's cursor marks the current drawing position, and is manipulated through input devices.

A. KEYBOARD

1. Numeric Values

2. Arrow Keys

B. JOYSTICKS : A stick attached to a ball and socket joint. Pulling the stick in any direction moves the cursor that direction.

C. TRACKBALL : A ball which is rolled in a socket to move cursor.

D. LIGHT/TOUCH PENS : Pen-like devices which "draw" directly on surface of monitor.

E. MOUSE : A device which is rolled on a flat surface producing corresponding cursor movements.

F. DIGITIZER : A device to translate images into digital information which can be read by a computer.

1. DIGITIZING TABLET : A flat surface which creates digitized images when drawn on by a positioning device.

2. SOUND DIGITIZER : Macrecorders

Positioning Devices:

a. PUCK : A mouse with crosshairs, used for precision drafting.

b. STYLUS : Electronic pencil used to draw on digitizing tablet.

c. NON-ACTIVE STYLUS : A passive pointer used with touch sensitive digitizers.

3. THREE DIMENSIONAL DIGITIZER : A device able to translate width, depth, and height coordinates of an actual object into digital information.

G. VIDEO INPUT

1. VIDEO CAMERA/S-VHS/ or High 8

2. FRAME GRABBER : A device which translates a single video image into digital information.

OUTPUT DEVICES :

Any instrument which displays or records an image received from the computer.

A. HARDCOPY : Printed or photographic output.

1. DOT MATRIX PRINTER : A printer which prints images using a pattern of dots.

2. INK JET PRINTER : Prints by depositing tiny spots of ink, using separate ink-jet heads for each color.

3. LASER PRINTER : Printer which uses a laser beam to translate video signals from computer onto an electron static image which is transferred and fused to paper.

B. PHOTOGRAPHY/SLIDES : 35 mm using Ektachrome 200 speed color

1. Long lens/Tripod
2. Slide Service
3. Film Recorder

C. VIDEO :

1. Animation
2. Overlaid Imagery
3. NuVista Overlay Board

INTERFACE :

A connection between two devices in a system which allows communication between them.

A. PORT : A connection to get information into or out of a device.

B. PARALLEL/SERIAL

1. SERIAL : An interface which handles information one bit at a time.

2. PARALLEL : An interface which handles information one byte at a time (one byte = one character).

C. BUS : A physical structure providing internal connections between circuits. (measured in bits that it can carry).

D. NU BUS PORT: Area in the CPU where additional cards can be installed for upgrades.
E. SLOT: Area in the CPU may hold additional cards.

SOFTWARE :

Programs written to enable the computer to perform specific tasks.

A. TERMS

1. BOOT UP : Reading (transferring) software into computer memory. Click, Double Click, and Click and Drag.

CRASH : Software failure usually requiring user to re-boot.

2. RASTER-BASED GRAPHICS SOFTWARE : (Pixel-based system) Keeps track of images pixel by pixel.

   a. PAINT SYSTEM

   b. JAGGIES OR ALIASING : Stepped look to curve or angular lines common in raster-based software.

3. VECTOR BASED GRAPHICS SOFTWARE : Images built of lines and polygons which are "remembered" by computer as mathematical formulas (algorithms).

   a. ALGORITHMS : Mathematical formula that describes a geometric form (line, square, polygon, etc.)

   b. WIREFRAME : A drawing of an object constructed through line segments.

   c. DRAFTING

4. GKS : Graphics Kernal System, an industrial standard being developed to solve the problem of interpreting commands and converting them into language understood by any input or output device.

B. COMPUTER GRAPHICS SOFTWARE TYPES

1. 2D - Drawing
2. 3D - Solids Modeling
3. Paint Systems

C. GRAPHICS APPLICATION SOFTWARE

1. Presentation Systems
2. Computer Aided Design (CAD)
3. Art and Design
4. Desktop Publishing

D. SOFTWARE FEATURES

1. Stored on Disk
2. Write Project
3. MENU DRIVEN : A system of organizing a software program which allows user to select options desired from a list.

a. ICON : A software menu system which utilizes symbols to stand for menu options.

b. SOFT BUTTONS : A system of selecting menu options by "pressing" representational buttons on monitor display.

4. TRANSFORMATIONS : Translate, Rotate, and Scale. Programmers terms for manipulating an object on the monitor screen through: a) moving
b) rotation
c) changing scale

5. TRANSMOGRIFY : Distort

6. HIDDEN LINE REMOVAL : A software feature that erases lines which are blocked from view in a three dimensional image.

7. WINDOWING : The subdivision of image area (CRT screen) into a rectilinear area or areas to allow independent functions (also called viewpoint).

8. CLIPPING : A feature which cuts off lines and forms that extend outside of a given rectangle or window.

9. ANTI-ALIASING : Software tricks which reduce the stepped or jagged look of angular and curved lines in raster-based systems.

10. ZOOM : Refers to enlarging a small segment of image to fill the whole screen.

11. PAN : Refers to moving a window or viewport around a larger image, only viewing one part at a time.

12. MASK : to mask out an area not to be disturbed while working near that image; similar to masking tape.

PAINT SYSTEMS

1. COLOR PALETTE: Colors available for use.

2. COLOR MAPPING : A table which stores the red, blue, green components for each color available on the screen. The R/G/B (Red/Green/Blue) components can be altered for each color, giving the user many more color choices.

3. DRAW : Draw freehand or choose end points.

a. RUBBER BAND LINE : Stretches a temporary line between the last point chosen and the current cursor position, allowing a preview of line to be drawn.

   - b. BRUSH/PEN : Drawing utensils analogous to the originals.
   - c. AIRBRUSH : A scattering of color meant to imitate airbrush, not effective as imitation unless in high resolution.

4. GEOMETRIC SHAPES : Commands to allow fast and accurate drawing of circles, ellipses, rectangles, and polygons.

5. FILL (BUCKET TOOL) : Fills designated area with chosen color.

6. TYPE FONTS (TEXT A)

7. ERASER

8. CAPTURE TOOLS
   - a. LASSO
   - b. MARQUEE

9. EYEDROPPER

10. QUICK EDIT COLORS

THE ELEMENTS AND PRINCIPLES OF VISUAL ORGANIZATION

ELEMENTS OF VISUAL ORGANIZATION

LINE
SHAPE
FORM
COLOR
SPACE
SIZE
TEXTURE
PATTERN

PRINCIPLES OF VISUAL ORGANIZATION

BALANCE
COMPOSITION
MOVEMENT
RHYTHM
VARIETY
ORIENTATION
UNITY
CONTRAST
VALUE

THE ELEMENTS OF VISUAL ORGANIZATION

Underlying all art forms are certain basic elements and principles; an understanding of which is essential for effective expression. They are the vocabulary with which thinking and feeling are expressed through art media.

FORM - Three-dimensional
SHAPE - Two-dimensional

All visual arts are concerned with form which describes the shape or structure of an object. There are only a few primary forms: cubes, cones, spheres, and cylinders. The form of an object gives it the dominant characteristic by which it is recognized. Drawing and painting deal with the two-dimensional forms which are called SHAPES. Sculpture and architecture deal with the three-dimensional forms. Shapes can also be defined as the outward or visible shape of an object as distinguished from its substance or color. Shapes or forms may be categorized into two distinct classes: GEOMETRIC or ORGANIC (AMORPHIC).

LINE

Line is a one-dimensional mark that indicates direction or form. It can divide, direct, describe, and express. Line is an important plastic element and is used as a symbol to indicate form. The character of the line may be used to express motion, texture, space, or to communicate factual material.

TEXTURE

Texture refers to surface quality or to a visual pattern and is closely related to the sense of touch. Concern for texture is highly regarded by industrial designers and manufacturers, and new materials are being continually added by modern science. Painters strive for interesting and varied textures, and sculptors and architects today gain unusual surface textures in their own forms.

ACTUAL TEXTURE
VISUAL TEXTURE

COLOR

Light contains all colors of the spectrum, balanced the effect is white. When light strikes an object, certain colors are absorbed and others, reflected. Color, in a scientific sense, is determined by the rays which are reflected to the eyes and those which are absorbed by the object. Color also has other attributes or dimensions such as hue, value, and intensity. While it is helpful to know the basic qualities and languages of colors, it is important to realize that the greatest learning takes place when one experiments with color and discovers all the exciting things it can do. In painting and advertising art today, the most unusual and appealing color combinations are highly experimental and inventive in nature. Present day concepts are not restricted to teaching various color theories as such.

SPACE

Space is defined as the interval within a boundary as positive or negative space.

SIZE

Size refers to the physical dimensions, proportions or magnitude or extent of something.

PATTERN

A single motif repeated several times makes up a pattern.

PRINCIPLES OF VISUAL ORGANIZATION

BALANCE

Balance refers to a visually favorable distribution of elements. Formal/informal.

COMPOSITION

Composition is the arrangement of pictorial elements into a picture or design.

MOVEMENT

Movement is the arrangement of parts in art to create a slow or fast movement of one's eye through the work.

RHYTHM

Rhythm is the regular repetition of any of the elements of a design, with or without periodic alteration.

VARIETY

Variety refers to an assortment; diversity in the elements of visual organization.

ORIENTATION

Orientation is the vertical or horizontal placement of a design.

UNITY

The arrangement of designs operating in unison is unity, whereby the composition and all elements and principles are working together.

CONTRAST

Contrast is the differences in values, colors, and /or textures, to achieve emphasis and interest.

VALUE

Value is the range from light to dark; High values are considered light, and low values are considered dark.

A History of Computer Art- the first decades

It is not surprising that the earliest computer art aficionados had many things in common. They were all part of the same generation, born between 1925 and 1940, between the two World Wars. Their heritage is not bound by national borders, but represents the internationality of highly industrialized countries: Western Europe, North America, and Japan. Their personal languages may have varied, but professionally they tended to express technical matters in English.

The ratio of PhD's involved in this group makes computer art the most heavily academic art form to have been developed. The very first computer art exhibitions, happening almost at the same time in 1965 in the U.S. and Germany were held not by artists but by scientists: Bela Julesz and A. Michael Noll at the Howard Wise Gallery, New York, and Georg Nees and Frieder Nake at Wendelin's Gallerie in Stuttgart. These scientists were mainly interested in research related to visual phenomena: visualization of acoustics, mathematical theory of aesthetics, foundations of binocular vision, etc. All of them brought a prior appreciation of art or even a practical skill like photography into computer graphics. Only toward the end of the 1960's did artists with an artistic education become involved, participating with scientists in two large scale shows: "Cybernetic Serendipity," organized in London for the Institute of Contemporary Art in 1968, and "Software," curated by Jack Burnham at the Jewish Museum in New York in 1970.

Most of the artists were constructivists, used to logically arranging form and color, voluntarily restricting themselves to a few well-defined image elements. Often their goal was to focus on the act of seeing and perception, stripping away any notion of content. They could relate to the simple imagery generated by computers and felt the computer could take over some of the executive work after the design was conceived. Usually the artists collaborated with scientists, sometimes in the form of a husband/wife team, because only scientists had access to machines in industrial research laboratories and university computer centers. Also, these early computer artists did not know computer programming and had to rely on the specialized knowledge of scientists.

The computers used were large mainframes, run in batch mode. Pen plotters, microfilm plotters, and line printers produced the output. Output was taken directly from the machine and exhibited. Moreover, the signatures were often plotted by the machines as part of the drawing program. Later artists used these graphics as sketches for manually produced paintings or as copy material for photographically transferred serigraphs. Artists also followed their tradition and signed their computer generated work by hand. Color was often only introduced in this later phase of post-production, or a limited range of colors could be achieved with the use of different colors of plotter pens. Input was even more restricted. Since no interactive means of controlling the computer existed, artists had to rely on programs and predefined data. Once fed into the computer there was no more creative interaction. The design process took place exclusively in the conceptualization prior to running a program. It took at least a decade, until Ivan Sutherland's interactive concepts demonstrated in 1963 with "Sketchpad" resulted in a breakthrough and the proliferation of paint systems, enabling the artist to draw directly into the computer's memory. Unlike today, when paint systems, sophisticated 3-D modelling software and video input are popular and quick ways of creating images, the first generation of computer artists had to focus on the logical and mathematical, in short, on abstract methods. To some extent it was this restriction which brought about creative concepts that were directly derived from the computer technology itself.

The computer was considered a "Universal Picture Generator" (Nake) capable of creating every possible picture out of a combination of available picture elements and colors. Obviously, a systematic application of the mathematics of combinatorics would lead to an inconceivable amount of pictures, good and bad ones, and would require and infinite production time in human terms, even if exactly computable. This raised the issue of pre-selecting a few elements which could be explored exhaustively and presented in a series or cluster of sub-images as one piece (Manfred Mohr). Other artists chose to investigate the full range between order and chaos, employing random number generators. In this way they could create numerous different images out of one program introducing change with the random selection of certain parameters—defining location, type, or size of a graphic element (Molnar, Struycken). Random numbers served to break the predictability of the computer simulating the act of human creation, since no other means of human interaction with the computer existed. Random numbers could be constrained to a limited numeric range and then applied to a set of rules of aesthetic relationships. If these rules were derived out of an analysis of traditional paintings, the program could simulate different similar designs (Noll). Or the artist could set up new rules for generating entire families of new aesthetic configurations, using random numbers for the decision making process of where and how to place graphic elements (Bangert, Zajec).

The end of the first decade of computer art coincided with important changes mainly due to two technological advances. The microprocessor was invented and interactive systems became common in the creative process. This started the migration of computer technology into art schools and artists' studios as well as into commercial production houses. The intimate collaboration between artists and scientists shifted in general to a situation where artists either became computer literate themselves (learning how to program), supported by the emergence of user-friendly general purpose and high-level graphics languages, or they used software bought off the shelf.

During the first five years of investigation, computer artists were created equal; they worked essentially with the same type of equipment and shared experiences worldwide. Then, in the mid-1960's and throughout the 1970's, the strong push of development happened exclusively in the United States; the heavy funding by the Department of Defense and the promising aspects of profitable industries fostered the sophistication of computer graphics technology and its broad proliferation. At the same time Europe observed a decline in computer art from which it has only recently recovered (recent work has been particularly strong in France.) The initial curiosity which had spurred the first public interest soon faded, the pictures themselves kept having a particular "computer" look, and no funding was available that could match the American efforts.

During the first decade of computer art the pioneering artists and scientists have proved that the creative human spirit and imagination remains the major ingredient and driving force in a highly automated environment. This short but important period also demonstrated that sophisticated machines existed which could assist in the process of creating art, a process constantly bridging mind and matter.

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114